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Proving Ecocide: The Plight of Pangolins as a Case Study for Fusing Ecological Science with International Law

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Abstract

Focusing on the case study of pangolins, which are among the most trafficked wildlife species on the planet, this article examines how ecological science can contribute to proving ecocide and other environmental crimes before international courts. It explores multiple vectors through which ecological science is suited to assisting forensic processes, including establishing the widespread, long-term, and severe elements of ecocide, as well as the gravity, causation, intention, and linkage tests, and the classification of victims. Building on that operational assessment, the authors argue that the relationship between science and law needs to be reconceptualized. Instead of the traditional fact-value binary, they advocate for increased recognition that both

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science and law involve a mix of fact-based and value-dependent assessments. At the same time, the study highlights challenges when incorporating disparate disciplines with separate ontologies and methodologies. Risks include the erosion of fair trial protections and the misunderstanding of requisite standards and approaches, as well as outsourcing dispositive assessments from the courts to scientific researchers. These insights are designed to assist the application of ecocide, and other environmental crimes during both war and peacetime, to protect living species facing multi-variate anthropogenic threats.

Keywords

ecocide – forensics – International Criminal Court – legislation – wildlife trafficking

1 Introduction: The Protective Power of Science and Law

Given the crisis-levels of wildlife trafficking, it is imperative to assess how international criminal law can address the exploitation of animal species.[1] The pangolin stands out, given that it is among the most trafficked wild mammals in the world.[2] Pangolin trade traverses multiple continents, including established routes from Africa *via* Europe to consumer markets in Asia. As a result, all species of pangolin have been classified as at risk of extinction.[3]

In the domain of international criminal law, ecocide has been hailed as a vehicle for prosecuting attacks on wildlife and other environmentally destructive acts.[4] Multiple commentators have noted the prevalence of

1 United Nations General Assembly, *Tackling illicit trafficking in wildlife* (Resolution 75/311) (UN, New York, NY, 2021), available online at https://documents.un.org/doc/undoc/gen/n21/205/05/pdf/n2120505.pdf.

2 International Fund for Animal Welfare (IFAW), *Pangolin FAQ: Learn about the world's most trafficked mammal* (IFAW, Washington, DC, 2022), available online at www.ifaw.org/au/journal/faq-pangolins (accessed 2 February 2025).

3 D. Challender and C. Waterman, *Implementation of CITES Decisions 17.239 b) and 17.240 on Pangolins* (*Manis spp.*) (CITES, Geneva, 2017), available online at https://cites.org/sites/default/files/eng/com/sc/69/E-SC69-57-A.pdf, pp. 1–2 (accessed 2 February 2025); see also J. Chang, 'China's Legal Response to Trafficking in Wild Animals: The Relationship between International Treaties and Chinese Law', in A. Peters (ed.), *Studies in Global Animal Law* 1st edn. (Springer, Berlin, 2020), p. 76 (on endangered status of Pangolin in China).

4 K. Mackintosh, O. Swaak-Goldman, G. Dawson and G. van der Woude, 'Wildlife Crime: Testing the Waters for Ecocide', paper presenterd at *An International Crime of Ecocide: New Perspectives Symposium*, UCLA School of Law, Los Angeles, CA, 2023.

wildlife exploitation and called for ecocide to address the extinction (or serious endangerment) of animal species.[5] Some have even called wildlife crime 'an environmental problem of more importance than ozone layer depletion, global warming, pollution, and contamination.'[6] Various leading formulations of ecocide include an offence of harming animal species.[7] Existing international crimes have also been hailed as a means to redress attacks on animals,[8] and the International Criminal Court's Prosecutor has proclaimed a commitment to prosecuting environmental harm.[9] Accordingly, there is a distinct possibility of proceedings focused on animal exploitation coming before the ICC. Against this backdrop, the study of pangolin exploitation provides an apposite bellwether for the Court's ability to redress serious harm to wildlife.

However, incorporating ecocide under the Rome Statute of the ICC requires a shift in orientation, from an overwhelmingly anthropocentric perspective towards accommodating ecocentric considerations.[10] These regulatory adjustments will be heavily influenced by scientific methods and epistemology, particularly ecology. As noted by Mackintosh *et al.* '[s]cientific evidence would

5 *Ibid*., p. 6 ('[a]cts which threaten a species with extinction would certainly be included [as severe incidents for the purpose of ecocide]'); L. Minkova, 'Ecocide, Sustainable Development and Critical Environmental Law Insights', 22(1) *Journal of International Criminal Justice* (2024) 81–97, at p. 82 ('Ecocide could be perpetrated through a broad range of means, from the destruction of ecosystems as a result of dam construction, to mass deforestation and species extinction following the establishment of palm oil plantations.'); M. Gillett (ed.), *Prosecuting environmental harm before the International Criminal Court* (Cambridge University Press, Cambridge, 2022), pp. 287–308, 328–330; L. Neyret, 'Pour la reconnaissance du crime d'écocide', 39 *Revue juridique de l'Environnement* (2014) 179–193, at pp. 182–183.

6 F.J. Broswimmer, *Ecocide: A Short History of the Mass Extinction of Species* (Pluto Press, Sterling, VA, 2002).

7 Neyret, *supra* note 5; L. Neyret *et al*., *From Ecocrimes to Ecocide: Protecting the Environment Through Criminal Law* (C-EENRG, Cambridge, 2017), p. 9 (Draft Convention against Ecocide, 2015 Article 1); D. Legge and S. Brooman, 'Reflecting on 25 Years of Teaching Animal Law: Is it Time for an International Crime of Animal Ecocide?', 41 *Liverpool Law Review* (2020) 201–218; M.A. Gray, 'The International Crime of Ecocide', 26(2) *California Western International Law Journal* (1996) 215–271, at p. 218; *see also* EU Directive 2008/99/EC of the European Parliament and of the European Council on the protection of the environment through criminal law.

8 *See, e.g*., M.J. Ventura, 'Repression of International Crimes', in A. Peters, J. de Hemptinne and R. Kolb (eds), *Animals in the International Law of Armed Conflict* (Cambridge University Press, Cambridge, 2023), pp. 313–333.

9 *See* International Criminal Court Office of the Prosecutor, *Draft Policy on Environmental Crimes Under the Rome Statute* (ICC, The Hague, 2024), available online at https://www.icc-cpi.int/sites/default/files/2024-12/2024-12-18-OTP-Policy-Environmental-Crime.pdf (accessed 2 February 2025).

10 Gillett, *supra* note 5, p. 40.

be needed to determine whether a particular action or group of actions in themselves caused a "substantial likelihood" of extinction, or threatened the survival of a species [for the purpose of establishing ecocide]'.[11] Incorporating this type of ecological evidence constitutes a novel step under international criminal law, which has not yet been applied to an animal-centred case despite many calls for the Court to do so.

In this light, the following analysis addresses pivotal issues for the prosecution of wildlife crime as ecocide, including its elements of long-term and widespread damage, issues of gravity, severity, causation, intent, and linkage, as well as the question of whether animal species could qualify as victims for the purposes of ICC proceedings. Noting the uncertainties that arise in probabilistic assessments of harm to endangered species such as pangolins, it examines the systemic risks of drastically increased reliance on scientific data, including misunderstandings and the potential abdication of the judicial function through outsourcing of legal determinations to scientific actors and the converse risk of juridifying ecological science. At the conceptual level, it explores the methodological and epistemological complementarities and incongruities that are revealed by the use of science in law.

Fundamentally, the article argues that incorporating science into law must not come at the expense of axiomatic legal protections, such as the presumption of innocence and must not degenerate to 'problem-feeding' from one discipline and practice to another, leading to a multiplicity of unresolved underlying issues. To mitigate these risks, it examines concrete areas in which ecological science can be infused into law and vice versa for the respective enhancement of each discipline. Its insights are not just theoretical but also of practical significance for potential ecocentric prosecutions of not only pangolin trafficking but also the exploitation of similarly endangered species.

Obligations to protect the environment are increasingly recognised as having a global character, owed *erga omnes*.[12] Whereas critiques have been raised against international criminal law *in toto* based on global North-South analyses, the present article proceeds from the normative position that atrocity crimes, including against the environment, should be redressed. On that basis, it seeks to examine how to best equip international institutions, such as the ICC, to incorporate findings from scientific disciplines. It bears recalling

11 Mackintosh, *supra* note 4, p. 6.

12 N. Oral, 'Environmental Protection as a Peremptory Norm of General International Law, Is It Time?', in D. Tladi (ed.), *Peremptory Norms of General International Law* (*Jus Cogens*), *Disquisitions and Disputations* (Brill-Nijhoff, Leiden, 2021), pp. 574–599, at pp. 591–593.

that international criminal law is not a panacea but can provide a safety net of regulatory enforcement for domestic systems, to cover regions which are unable or unwilling to investigate and prosecute these crimes themselves.[13] This is particularly important in disrupted states facing regulatory collapse. International criminal law can promote cross-border law enforcement cooperation, which is apposite in relation to crimes involving the movement of captured or killed endangered animals across a range of countries.[14] Moreover, the expressive and symbolic message of criminalizing harm to the environment at the international level can provide a powerful deterrent effect, particularly to corporations and their shareholders.

However, the lack of precedent means that the mechanics and theoretical implications of prosecuting crimes against animals at the international level remain under-explored. As Aparac notes, 'the interdisciplinary approach to environmental destruction through international environmental law and international criminal law has not been sufficiently explored until this day'.[15] Analogously, Ruiz *et al.* note that the natural and social sciences 'need to be intellectually receptive and sympathetic to each other in order to synthesize useful knowledge regarding environmental threats'.[16] Given the precarious state of many animal species in the face of habitat destruction, poaching, and toxic pollution, this article seeks to provide a timely insight into inter-disciplinary ecological investigations.

In Section 2, the article provides several critical data points from ecological science demonstrating anthropogenic harms to pangolins, along with indirect harms that will be caused by the removal of pangolins from ecosystems they inhabit. In doing so, it exemplifies the range of methods and

13 International justice is designed to operate as a safety net when domestic authorities are unable or unwilling to act; Rome Statute, Article 17.

14 In the case of pangolins, several countries have been identified as source and transit countries, with scales in particular often originating in Africa, passing through Europe, and onto destination markets in China, Hong Kong Special Administrative Region and Vietnam. Although China and Vietnam are not ICC State Parties, several source countries in Africa, and all transit countries in Europe, are drawing the offending into the Court's jurisdictional ambit.

15 J. Aparac, 'A missed opportunity for accountability? Corporate responsibility and the draft definition of ecocide', *Voelkerrechtsblog* (2021), available online at https://voelkerrechtsblog.org/a-missed-opportunity-for-accountability/ (accessed 2 February 2025).

16 A.G. Ruiz, N. South and A. Brisman, 'Eco-crimes and ecocide at sea: Toward a new blue criminology', 66 *International Journal of Offender Therapy and Comparative Criminology* (2022) 407–429, doi: 10.1177/0306624X20967950.

sources used in ecology studies to collect that data. In Section 3, the article sets out leading formulations of ecocide as an international crime. Thereafter, Section 4 superimposes the legal framework governing the proposed crime of ecocide onto the ecological record concerning pangolins. Finally, Section 5 of the article broadens the scope to set out the normative and conceptual insights generated from the infusion of science into international criminal law based on the study of pangolin exploitation as ecocide.

2 An Ecological Outline of the Plight of Pangolins

2.1 *Pangolin Ecology and Exploitation*

Given the egregious levels of pangolin trafficking, they epitomize the plight of wildlife species in the face of anthropocentric harm.[17]

Pangolins are placental mammals covered in overlapping keratin scales. They belong to the family Manidae in the order Pholitoda. There are eight recognized species of pangolin, all of which have been listed in CITES Appendix I since 2017. However, due to the heavy demand for pangolin products online and on the black market, a consistent decline in pangolin numbers in the wild has been reported. The International Union for Conservation of Nature (IUCN) produces a Red List which describes the geographic range, population size, habitat and ecology, use and trade, threats and conservation actions for animal species worldwide. There are nine categories to which species are assigned, with the highest being Critically Endangered, Extinct in the Wild and Extinct. Criteria for each of these categories are based on numerical thresholds. Species only need to meet one of these five criteria to be categorized (Table 1).

Recent IUCN listings for pangolins, which provide the most accurate assessment of population conservation status for these animals, were assessed in 2019. The eight species of pangolin currently listed by the IUCN are Temminck's, Black-bellied, White- bellied, Indian, Sunda, Chinese, Giant Ground and Philippines. All are listed as vulnerable or higher on the Red List (Table 2).

17 IFAW, *supra* note 2. The current article focuses on wildlife; for relevant considerations on livestock trade, *see* M. Lostal, A. Shanker and D. Calley, 'One Step Forward, Two Steps Back: The Search For "Rights" in the Ecuador Animal Rights Bill', 2(1) *Animal and Legal Policy Studies* (2024) 504–587, doi: 10.36151/DALPS.033.

TABLE 1 Criteria for categorisation of a species into the IUCN Red List as Critically Endangered, Endangered and Vulnerable.

	Vulnerable	Endangered	Critically Endangered
Population reduction	A population size reduction of ≥50% where the causes of the reduction are ceased, OR reduction ≥30% where the causes may not have been ceased	A population size reduction of ≥70% where the causes of the reduction are ceased, OR reduction ≥50% where the causes may not have been ceased	A population size reduction of ≥90% where the causes of the reduction are ceased, OR reduction ≥80% where the causes may not have been ceased
Restricted geographic range	Extent of occurrence estimated to be less than 20 000 km^2	Extent of occurrence estimated to be less than 5000 km^2	Extent of occurrence estimated to be less than 100 km^2
Small population size and decline	Population size estimated fewer than 10 000 mature individuals AND an estimated continuing decline of at least 10% within ten years or three generations	Population size estimated fewer than 2500 mature individuals AND an estimated continuing decline of at least 20% within five years or two generations	Population size estimated fewer than 250 mature individuals AND an estimated continuing decline of at least 25% within three years or one generation
Small or restricted population	Population size estimated fewer than 1000 mature individuals	Population size estimated fewer than 250 mature individuals	Population size estimated fewer than 50 mature individuals
Extinction probability analysis	Probability of extinction in the wild ≥10% within 100 years	Probability of extinction in the wild ≥20% within 20 years or five generations	Probability of extinction in the wild ≥50% within 10 years or three generations

More detail for each criteria is included in the original document (IUCN, *IUCN Red List Categories and Criteria: Version 3.1*, 2nd edn. IUCN, Gland, 2012), but has been abbreviated here for simplicity.[18]

18 IUCN. (2012). IUCN Red List Categories and Criteria: Version 3.1. Second edition. Gland, Switzerland and Cambridge.

TABLE 2 Descriptions of IUCN Categorisations, Geographical Ranges and Population Descriptions of All Currently Surviving Pangolin Species as per Data from the IUCN Red List Resources.

Species	Status	Trend	Population size	Geographic range
Temminck's (*Smutsia temminckii*)	Vulnerable	Decreasing	South Africa estimate from 2019 lists 16329 to 24102 mature individuals, data from other African regions is limited. Estimate of population density=0.11–0.24 individuals/ km^2	Angola, Botswana, Burundi, Central African Republic, Chad, Congo, Ethiopia, Kenya, Malawi, Mozambique, Namibia, Rwanda, South Africa, South Sudan, Sudan, Tanzania, Uganda, Zambia, Zimbabwe
Black-bellied (*Phataginus tetradactyla*)	Vulnerable	Decreasing	The least frequently recorded of all African pangolin species, no formal population estimates exist. Estimate of population density=1.5 individuals/ km^2	Angola, Cameroon, Central African Republic, Congo, Côte d'Ivoire, Equatorial Guinea, Gabon, Ghana, Guinea, Liberia, Nigeria, Sierra Leone, Uganda
White-bellied (*Manis tricuspis*)	Endangered	Decreasing	Limited data, qualitative reports describe a population in continuous decline. Estimate of population density=0.68–0.84 individuals/ km^2	Angola, Benin, Burundi, Cameroon, Central African Republic, Congo, Côte d'Ivoire, Equatorial Guinea, Guinea, Gabon, Kenya, Liberia, Nigeria, Rwanda, Sierra Leone, South Sudan, Tanzania, Togo, Uganda, Zambia

TABLE 2 Descriptions of iucn Categorisations, Geographical Ranges and Population Descriptions of All Currently Surviving Pangolin Species as per Data from the iucn Red List Resources. (*cont.*)

Species	Status	Trend	Population size	Geographic range
Giant Ground (*Smutsia gigantea*)	Endangered	Decreasing	Estimate of population density=0.13 individuals/km^2	Cameroon, Central African Republic, Congo, Côte d'Ivoire; Equatorial Guinea, Gabon, Ghana, Guinea- Bissau, Liberia, Nigeria, Rwanda, Senegal, Sierra Leone, South Sudan, Tanzania, Uganda
Indian (*Manis crassicaudata*)	Endangered	Decreasing	In Pakistan, estimated density declined by approx. 79% between 2010 and 2012. Sri Lanka Yagirala Forest estimated density=5.69 individuals/ km^2, Pakistan estimated density=0.1–0.37 individuals/ km^2	Bangladesh, India, Nepal, Pakistan, Sri Lanka
Sunda (*Manis javanica*)	Critically endangered	Decreasing	Singapore estimate from 2019 lists 1068 individuals, data from other locations is very limited	Brunei Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Singapore, Thailand, Viet Nam

TABLE 2 Descriptions of iucn Categorisations, Geographical Ranges and Population Descriptions of All Currently Surviving Pangolin Species as per Data from the iucn Red List Resources. (*cont.*)

Species	Status	Trend	Population size	Geographic range
Philippine (*Manis culionensis*)	Critically endangered	Decreasing	Limited information, estimated 85–95% reduction in population between 1980 and 2018. Mean estimate of population density=2.5±1.4 adults/ km^2	Philippines
Chinese (*Manis pentadactyla*)	Critically endangered	Decreasing	Nepal estimate 5000 individuals Taiwan estimate 15000 individuals. China estimates 25 100–49 450 individuals (in 2008)	Bangladesh, Bhutan, China, Hong Kong, India, Lao People's Democratic Republic, Myanmar, Nepal, Taiwan, Thailand, Viet Nam

Population density estimates are limited by the fact that no survey data has been listed by the IUCN since 2008–2018.[19]

19 D. Challender, D.H.A. Willcox, E. Panjang, N. Lim, H. Nash, S. Heinrich and J. Chong, '*Manis javanica*', in *The IUCN Red List of Threatened Species* (IUCN, Gland, 2019), e.T12763A123584856, doi: IUCN.UK.2019-3.RLTS.T12763A123584856.en (accessed 2 February 2025); D.J. Ingram, M.H. Shirley, D. Pietersen, I. Godwill Ichu, O. Sodeinde, C. Moumbolou, M. Hoffmann, M. Gudehus and D. Challender, '*Phataginus tetradactyla*', in *The IUCN Red List of Threatened Species* (IUCN, Gland, 2019), e.T12766A123586126, doi: IUCN.UK.2019-3.RLTS.T12766A123586126.en (accessed 2 February 2025); IUCN, *The IUCN Red List of Threatened Species*, Version 2024-1 (IUCN, Gland, 2024), available online at https://www.iucnredlist.org; S.B. Jer, 'Ecocide or environmental self-destruction?', 41 *Environmental Ethics* (2019) 237–247, doi: 10.5840/enviroethics201941324; T. Mahmood, D. Challender, A. Khatiwada, S. Andleeb, P. Perera, S. Trageser, A. Ghose and R. Mohapatra, '*Manis crassicaudata*', in *The IUCN Red List of Threatened Species* (IUCN, Gland, 2019), e.T12761A123583998, available online at https://www.iucnredlist.org/species/12761/123583998 (accessed 2 February 2025); D. Pietersen, C. Moumbolou, D.J. Ingram, D. Soewu, R. Jansen, O. Sodeinde, C. Keboy Mov Linkey Iflankoy, D. Challender and M.H. Shirley, '*Phataginus tricuspis*', in *The IUCN Red List of Threatened Species* (IUCN, Gland, 2019), e.T12767A123586469, doi: IUCN.UK.2019-3.RLTS.T12767A123586469.en (accessed 2 February 2025); S. Schoppe, L. Katsis and L. Lagrada, '*Manis culionensis*', in *The iucn Red List of Threatened Species* (iucn, Gland, 2019), e.T136497A123586862', doi: IUCN.UK.2019-3.RLTS .T136497A123586862.en (accessed 2 February 2025).

It is widely accepted that pangolin populations are declining across traditional habitats in Africa[20] and Asia.[21] Major drivers of population decline have been identified as habitat degradation and overexploitation.[22] Although definitive global pangolin population estimates are lacking due to their furtive, solitary, and nocturnal nature, it is clear that sub-populations have faced drastic declines. Population descriptions of all pangolin species by the IUCN states that local residents overall report a significant decline in pangolin numbers over the last 20 to 30 years. For example, community members on Palawan Island and the Calamian Islands report a shift in Philippine pangolins from relatively common to quite rare from 2000 onwards.[23] Other populations have reportedly suffered losses of up to 94%, as in the case of the Chinese Pangolin in China.[24] All accounts report exploitation for pangolin products as the primary driver for this decline. Although the exploitation of pangolins is criminalised under national laws, such as China's Wildlife Protection Law, global wildlife trafficking of pangolins and pangolin products continues.

The spatio-temporal fluctuations in pangolin distribution and the overall trends in population numbers are clearly relevant to species endangerment. But for litigation purposes, transparent and methodologically sound approaches need to be ensured. For example, IUCN numbers will likely be treated as authoritative sources by the ICC, as a fellow international organisation. Yet this is an institutional rather than a scientific basis for deference. Instead, ecological scientists should be consulted regarding best practices in determining population numbers. At the same time, rifts between the Court's conclusions and those of environmental organisations would undermine public confidence in international regulatory institutions.

Problematically, estimates of pangolins numbers in all regions are extremely limited. This is principally due to the species' increasing rarity, a problem exacerbated by its nocturnal and elusive behaviour. Accurate population estimates are important for understanding spatio-temporal changes in pangolin distribution and abundance and therefore to guide effective conservation management strategies. Population impacts are also important to assess the gravity of incidents of pangolin exploitation.

20 S. Zanvo, P. Gaubert, C.A.M.S. Djagoun, A. F. Azihou, B. Djossa and B. Sinsin, 'Assessing the spatiotemporal dynamics of endangered mammals through local ecological knowledge combined with direct evidence: The case of pangolins in Benin (West Africa)', 23 *Global Ecology and Conservation* (2020) e01085, doi: 10.1016/j.gecco.2020.e01085.

21 *Ibid*.

22 *Ibid*.

23 Schoppe *et al*., *supra* note 19.

24 Challender, *supra* note 3.

Recent advancements, such as camera-trap estimated abundance studies, have significantly improved the accuracy of population investigations.[25] But in countries with financial constraints and where long-term data is scarce, innovative and affordable solutions such as Local Ecological Knowledge (LEK)-based surveys can be more appropriate.[26] These methods provide critical insights into the optimal management of habitat preservation, resource availability and genetic diversity, and provide valuable data to highlight the urgency of conservation efforts.

A high proportion of juvenile and subadult animals being targeted provides further evidence of unsustainable hunting activities.[27] Pangolins take two years to reach sexual maturity and produce only 1–3 offspring per year, with some species being seasonal breeders[28] and others being aseasonal breeders.[29] The high proportion of young animals being hunted before they reach sexual maturity therefore reduces the breeding population, which further jeopardizes

25 H. Khwaja, C. Buchan, O.R. Wearn, L. Bahaa-el-din, D. Bantlin, H. Bernard, R. Bitariho, T. Bohm, J. Borah, J. Brodie, W. Chutipong, B. du Preez, A. Ebang-Mbele, S. Edwards, E. Fairet, J.L. Frechette, A. Garside, L. Gibson, A. Giordano, G. Veeraswami Gopi, A. Granados, S. Gubbi, F. Harich, B. Haurez, R.W. Havmøller, O. Helmy, L.A. Isbell, K. Jenks, R. Kalle, A. Kamjing, D. Khamcha, C. Kiebou-Opepa, M. Kinnaird, C. Kruger, A. Laudisoit, A. Lynam, S.E. Macdonald, J. Mathai, J. Metsio Sienne, A. Meier, D. Mills, J. Mohd-Azlan, Y. Nakashima, H.C. Nash, D. Ngoprasert, A. Nguyen, T. O'Brien, D. Olson, C. Orbell, J. Poulsen, T. Ramesh, D.A. Reeder, R. Reyna, L.N. Rich, J. Rode-Margono, F. Rovero, D. Sheil, M.H. Shirley, K. Stratford, N. Sukumal, S. Suwanrat, N. Tantipisanuh, A. Tilker, T. Van Berkel, L.K. Van der Weyde, M. Varney, F. Weise, I. Wiesel, Andreas Wilting, S.T. Wong, C. Waterman and D.W.S. Challender, 'Pangolins in global camera trap data: Implications for ecological monitoring', 20 *Global Ecology and Conservation* (2019) e00769, doi: 10.1016/j.gecco.2019.e00769; M.E. Maurice, N.A. Fuashi, E.L. Ebong, A.F. Zeh, N.H. Mengwi and O.A.F. Gildas, 'A survey on the status of pangolins by camera trapping in Deng-Deng National Park, Eastern Region, Cameroon', 5 *Journal of Environment and Health Science* (2019) 40–46, doi: 10.15436/2378-6841.19.2430; D. Willcox, H. Nash, S. Trageser, H.J. Kim, L. Hywood, E. Connelly, I.G. Ichu, C.L.M. Moumbolou, D. Ingram and D.W.S. Challender, 'Evaluating methods for the detection and ecological monitoring of pangolins (Pholidota: Manidae)', 17 *Global Ecology and Conservation* (2019) e00539, doi: 10.1016/j.gecco.2019.e00539.

26 Nash, *supra* note 19; Zanvo, *supra* note 20.

27 D. J. Ingram, L. Coad, K. A. Abernethy, F. Maisels, E. J. Stokes, K. S. Bobo, T. Breuer, E. Gandiwa, A. Ghiurghi, E. Greengrass, T. Holmern, T. O. W. Kamgaing, A. N. Obiang, J. R. Poulsen, J. Schleicher, M. R. Nielsen, H. Solly, C. Vath, M. Waltert, C. E. L. Whitham, D. S. Wilkie and J. P. W. Scharlemann, 'Assessing Africa-wide pangolin exploitation by scaling local data', 11 *Conservation Letters* (2017) e12389, doi: 10.1111/conl.12389.

28 T.L. Suwal, S. Gurung and K.J. Pei, 'Pangolin seizures in Nepal indicate priority areas for conservation interventions', 57(6) *Oryx* (2023) 727–734, doi: 10.1017/S0030605322000850.

29 F. Zhang, S. Wu, L. Yang, L. Zhang, R. Sun and S. Li, 'Reproductive parameters of the Sunda pangolin, Manis javanica', 64 *Journal of School of Life Sciences South, China Normal University* (2015) 129–135, doi: 10.1002/z00.21526.

the population's stability.[30] While these figures cannot provide a precise response as to whether or when pangolin species will become extinct, the lack of certainty should not constitute a bar to prosecutions for environmental crimes.

The reported population declines, restricted habitat range and higher proportion of younger animals being hunted is an alarming combination, threatening instability in these species populations. Whilst there are local and international regulations in place aimed at addressing the over-exploitation of these species, enforcement is minimal, and there is limited evidence that efforts to reduce demand for pangolin products and derivatives in key consumer countries are effective.

In relation to the exploitation of pangolins as a form of ecocide, establishing a causative relationship between the decline of pangolin populations and their capture for the illegal wildlife trade would be central to proving anthropogenic endangerment.[31]

2.2 *Pangolins in Captivity*

Supporting the conservation of pangolins through captive breeding at zoos and farms is not a viable option due to these species' unique characteristics. Over the past decade, zoos and other organisations worldwide have attempted to captive breed pangolins for conservation. However, breeding programs to date have been largely unsuccessful,[32] due to low reproductive rates, highly specialized diets and extreme sensitivity to stress and disease, meaning captive breeding is unlikely to ever replenish wild populations harvested by hunters.

In China, there are commercial farms licensed by the government to legally breed pangolins in captivity for medicinal purposes. A 2019 study reported that captive bred pangolins only met 4–6 out of 17 conditions for supply-side interventions to displace wild-caught collections. Additionally, a lack of effective certification systems creates the possibility that these commercial farms could be illegally sourcing wild pangolins to launder through legal supply chains.[33]

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30 S. Chin, C. Lien, Y. Chan, C. Chen, Y. Yang and L. Yeh, 'Monitoring the gestation period of rescued Formosan pangolin (*Manis pentadactyla pentadactyla*) with progesterone radioimmunoassay', 31 *Zoo Biology* (2011) 479–489. DOI 10.1002/zoo.20413; Ingram, *supra* note 27.

31 See below in Sections 3 and 4, discussions of causation.

32 L. Hua, S. Gong, F. Wang, W. Li, Y. Ge, X. Li and F. Hou, 'Captive breeding of pangolins: Current status, problems and future prospects', *ZooKeys* (2015) 99–114, doi: 10.3897/zookeys.507.6970.

33 D.W.S. Challender, M. Sas-Rolfes, G.W.J. Ades, J.S.C. Chin, N.C.-M. Sun, J. Chong, E. Connelly, L. Hywood, S. Luz, R.K. Mohapatra, P. de Ornellas, K. Parker, D.W. Pietersen, S.I. Roberton, G. Semiadi, D. Shaw, C.R. Shepherd, P. Thomson, Y. Wang, L. Wicker and

Captive breeding of pangolins is not a viable solution and does not address, but instead fuels, the growing demand for their products; the survival of all pangolin species depends on their protection and continued existence in the wild. For this to be possible, ecological studies indicate that illegal poaching must be stopped. The number of pangolins taken from the wild for sale as traditional medicines and bushmeat far outweighs the rate at which their populations can replace themselves, and so the persistence of the pangolin trade could be considered to cause sufficiently grave environmental harm to constitute ecocide.[34] The hunting of pangolins is a deliberate and wanton action which is rapidly leading to the extinction of eight different species and should be prosecuted as such.

2.3 *Broader Importance of Pangolins to the Natural Environment*

For ecocide and environmental harm prosecutions, it will be relevant to highlight the positive role that pangolins play in the ecosystems they inhabit. Pangolins assist the dynamic equilibrium of their ecosystems by regulating insect populations, as their diet consists mainly of ants and termites.[35] It is estimated an average pangolin consumes 70 million insects annually, and consequently insect population sizes would increase dramatically with the extinction of the pangolin.[36] By controlling termite numbers, pangolins help prevent the destruction of forests through the actions of excessive termite populations. Pangolins can assist anthropocentric interests by saving the agricultural industry millions of dollars a year in pest control.[37]

Furthermore, the natural burrowing habits of pangolins are ecosystem engineers and support biodiversity by offering habitats to other species. A pangolin burrow consists of a complex, underground network with many entrances between rocks and tree roots, spanning up to 75 metres long and 4 metres deep.[38] These burrows often intersect, forming ovoid resting chambers. Larger pangolin burrows are

H.C. Nash, 'Evaluating the feasibility of pangolin farming and its potential conservation impact', 20 *Global Ecology and Conservation* (2019) e00714, doi: 10.1016/j.gecco.2019.e00714.

34 This article does not delve into the moral and historic arguments regarding traditional cultural practices, but instead focuses on effectuating the prosecution of activities which the vast majority of States around the World have recognised as unlawful.

35 J.T. Chao, H.F. Li and C.C. Lin, 'The role of pangolins in ecosystems', in D.W.S. Challender, H.C. Nash and C. Waterman (eds), *Pangolins: Science, society and conservation* (Academic Press, San Diego, CA, 2020), pp. 43–48; S. Sun, H. Dou, S. Wei, Y. Fang, Z. Long, J. Wang, F. An, J. Xu, T. Xue, H. Qiu, Y. Hua and G. Jiang, 'A review of the engineering role of burrowing animals: Implication of Chinese pangolin as an ecosystem engineer', 3 *Journal of Zoological Research* (2021) e32, doi: 10.30564/jzr.v3i3.3102.

36 Hua, *supra* note 32.

37 S.B. Wu, G.Z. Ma, M. Than, H. Chen and D.F. Liu, 'The status and conservation strategy of pangolin resource in China', 17(2) *Journal of Natural Resources* (2002) 174–180. (in Chinese).

38 D. Lehmann, M.L. Halbwax, L. Makaga, R. Whytock, L. Ndindiwe Malata, W. Bombenda Mouele, B.R. Momboua, A.F.K. Pambo and L.J.T. White, 'Pangolins and bats living together

sometimes shared by other species, including brush-tailed porcupines, small rodents, mongooses, bats, and African Rock Pythons.[39] The burrowing activities of the pangolins also assist in soil aeration and nutrient cycling, which is important as aeration helps prevent oxygen starvation in plants, providing benefits both to the environment and agricultural plantations.[40] The evacuation of new burrows also results in the turnover of organic matter and works to reduce soil adhesion.[41] This is beneficial to the environment as increased soil adhesion often causes an increase in working resistance, preventing the growth of roots. It also increases the energy required for cutting or tillage tools in agriculture.

On this basis, the loss of pangolin species in the wild would have severe consequences for these natural habitats and likely contribute to instability in other local species populations.

2.4 *Pangolin Derivatives and Online Markets For Pangolin Products*

Scales are the most trafficked component of the pangolin. They are used in traditional medicines, due to unfounded beliefs that they promote physical health, heal respiratory illnesses and spinal muscular atrophy, and even cure breast cancer. The pangolin tongue is believed in certain localities to cure stomach aches, pneumonia and hip pain. Bones are used to treat osteoarthritis, and pangolin blood is believed to cure asthma. The head of the pangolin is believed to improve sexual libido, drive out unnatural powers and bring in good luck.[42] Medicines containing pangolin scales continue to appeal towards wealthy patients, who desire to flaunt their status. However, there is currently no reliable evidence found in scientific literature regarding the medicinal value of pangolin scales,[43] calling into question the basis for treatments developed

in underground burrows in Lopé National Park, Gabon', 58 *African Journal of Ecology* (2020) 540–542, doi: 10.1111/aje.12759.

39 *Ibid.*

40 Earth Observing System Data Analytics, *Soil Aeration* (EOS, Mountain view, CA, 2024), available online at https://eos.com/blog/soil-aeration/#:~:text=The%20process%20of%20soil%20aeration,if%20they%20rise%20too%20high (accessed 2 February 2025).

41 L.Q. Ren, Z.W. Han, J.Q. Li and J. Tong, 'Experimental investigation of bionic rough curved soil cutting blade surface to reduce soil adhesion and friction', 85 *Soil & Tillage Research* (2006) 1–12, doi: 10.1016/j.still.2004.10.006.

42 S. Zanvo, S. Djagoun, F. Azihou, B. Djossa, B. Sinsin and P. Gaubert, 'Ethnozoological and commercial drivers of the pangolin trade in Benin', 17 *Journal of Ethnobiology and Ethnomedicine* (2021) 18, doi: 10.1186/s13002-021-00446-z.

43 R.L. Jacobs, P.J. McClure, B.W. Baker and E.O. Espinoza, 'Myth debunked: Keratinous pangolin scales do not contain the analgesic tramadol', 1 *Conservation Science and Practice* (2019) e25, doi: 10.1111/csp2.82; X. Jin, H.Z. Chua, K. Wang, N. Li, W. Zheng, W. Pang, F.W. Yang, B. Pang, M. Zhang and J. Zhang, 'Evidence for the medicinal value of Squama Manitis (pangolin scale): A systematic review', 10 *Integrative Medicine Research* (2021) 100486, doi: 10.1016/j.imr.2020.100486.

under current patents rather than traditional pharmacopeia that are the embodiment of past customs.[44]

Domestic responses vary. While local governments often perform checks on public markets for pangolin parts, many of these private clinics go unchecked and are unregulated, including by the Chinese government.[45] A small proportion of pangolin scales remain in African countries, where some consumers still seek traditional healers over state run government hospitals to provide healthcare. Traditional healthcare is still prevalent in several developing nations worldwide, in some areas 80% of the population is reported to continue to use traditional healthcare on its own or in conjunction with conventional medications.[46]

In relation to identifying drivers and perpetrators of pangolin exploitation, a recent report by Global Initiative, which monitors transnational organized crime, found that over half of online advertisements (64%) marketing pangolin-derived products were from Chinese 'agent' websites.[47] 'Agents' serve as intermediaries offering medical or healthcare services to consumers by making recommendations based on symptoms submitted by users and providing links to sites where medicines can be purchased. They are not bound by the same rules as e-commerce Traditional Chinese Medicine (TCM) manufacturers.[48] Therefore, these agent websites are contributing greatly to the trade of pangolin-derived products and appear to be creating a loophole in the regulations. This has implications for the pangolin populations in Africa, encouraging the continuous trafficking of African pangolins to meet the high demands for pangolin scales in Asia, especially as the Asian pangolin populations have been over-harvested. As a result, international trafficking routes are being increasingly used to supply the demand.[49]

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44 S.P. Heighton and P. Gaubert, 'A timely systematic review on pangolin research, commercialization, and popularization to identify knowledge gaps and produce conservation guidelines', 256 *Biological Conservation* (2021) 109042, doi: 10.1016/j.biocon.2021.109042.

45 R. Sexton, T. Nguyen and D. Roberts, 'The use and prescription of pangolin in traditional Vietnamese medicine', 14 *Tropical Conservation Science* (2021) 14, doi: 10.1177/19400829209857 55.

46 M. Boakye, D. Pietersen, A. Kotze, D. Dalton, R. Jansen and J. Ai, 'Knowledge and uses of African pangolins as a source of traditional medicine in Ghana', 10 *PLoS ONE* (2015) e0117199, doi: 10.1371/journal.pone.0117199.

47 Global Initiative against Transnational Organized Crime (GI-TOC), *Online markets for pangolin-derived products* (globalinitiative.net, Geneva, 2021), available online at https://globalinitiative.net/wp-content/uploads/2022/07/GITOC-MMFU-Online-markets-for-pangolin-derived-products.pdf (accessed 2 February 2025).

48 *Ibid*.

49 *Ibid*; X. Ling, J. Guan, W. Lau and Y. Xiao, *An overview of pangolin trade in China*, TRAFFIC Briefing (TRSAFFIC, Cambridge, 2016).

While the Chinese government upgraded the protection status of all pangolin species in 2020 from Class II to Class I of its domestic wildlife protection, offering the same legal protection as the giant panda[50] and officially removed then from the 'Pharmacopeia of the People's Republic of China' (the country's official compendium of drugs), pangolin scales are still included as an ingredient in some patent medicines.[51] Heighton and Gaubert reported a growth in patents per year occurred from 2011 to 2016, after which it dropped drastically (Figure 1). A radical drop of patents from 2016 onwards is suggested to be associated with the decision to up-list all eight pangolin species to Appendix I of the CITES framework.[52]

Because the online market does not follow the full scope of laws regulating the market in China and internationally, it drives demand for illegally trafficked

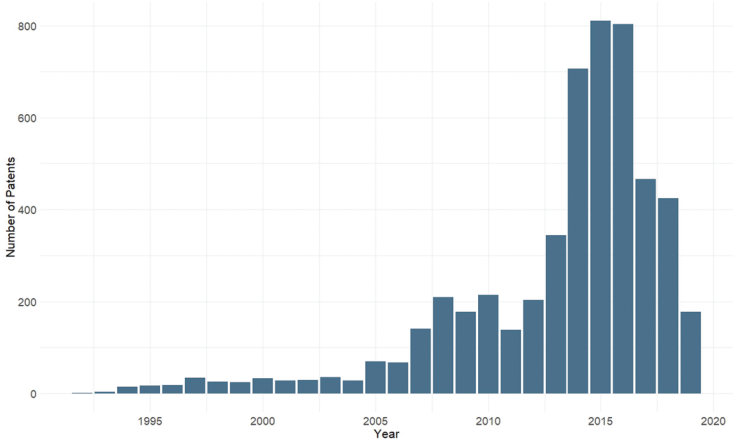

FIGURE 1 The number of patented Traditional Chinese Medicine (TCM) products which include pangolin scales as an ingredient between 1993–2020 (raw data derived from Heighton & Gaubert[53]).

50 World Wildlife Fund, *WWF welcomes China's move to strengthen protection for Chinese pangolins- amid concerns for human health* (WWF, Gland, 2020), available online at https://wwf.panda.org/wwf_news/?364291/WWF-welcomes-Chinas-move-to-strengthen-protection-for-Chinese-pangolins---amid-concerns-for-human-health (accessed 2 February 2025).

51 Environmental Investigation Agency, *Despite the headlines, China's Government still promotes pangolin scales in traditional medicines* (EIA, London, 2020), available online at https://eia-international.org/news/despite-the-headlines-chinas-government-still-promotes-pangolin-scales-in-traditional-medicines/#:~:text=Now%20EIA%20has%20obtained%20a,medicinal%20use%20of%20pangolin%20scales (accessed 2 February 2025); Heighton, *supra* note 44.

52 Heighton, *supra* note 44.

53 S.P. Heighton and P. Gaubert, 'A timely systematic review on pangolin research, commercialization, and popularization to identify knowledge gaps and produce conservation guidelines', 256 *Biological Conservation* (2021) 109042, doi: 10.1016/j.biocon.2021.109042.

pangolin scales.[54] Pangolins are threatened with extinction mostly because of the usage of their scales in TCM, and the online trade for pangolin-derived products only further contributes to this existential crisis for pangolins. At the domestic level more pressure from the Chinese authorities and law enforcement agencies, within and outside of China, is needed to implement stricter laws to discourage the illicit trade in pangolin-derived products.

Another important aspect of pangolin harvesting is for the bushmeat trade. Pangolin meat is highly valued both in parts of Africa and internationally, considered both as sustenance and as a delicacy. Overhunting and over-exploitation of wildlife for bushmeat is currently a major challenge across regions in central Africa.[55] Recent evidence has shown that due to the interconnectivity of the global trade, pangolin products are increasingly being transported through European airports to supply international markets.[56] However, not only is this exacerbating the decline of pangolin populations, unregulated hunting and bushmeat preparation and preservation practices can constitute threats to human health.[57] As with other wildlife products, the internet and social media is suspected of facilitating this trade and engaging a wider global audience.[58]

Over recent years, new trends including new motivations for product use are contributing to the highly unsustainable demand for pangolin-derived products. In fashion, pangolin leather is in demand for exotic cowboy leather boots, bags and belts.[59] Such items can be found on e-commerce sites such as eBay, valued at a starting price of US$1500 and offering international shipping.[60] The growing spread of cross-border online shopping threatens to exacerbate this exploitation.

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54 GI-TOC, *supra* note 47; Ling, *supra* note 49.

55 L.B. Nguyen, E.E. Fossung, C.A. Nkoa and T. Humle, 'Understanding consumer demand for bushmeat in urban centers of Cameroon with a focus on pangolin species', 3 *Conservation Science and Practice* (2021) e419, doi: 10.1111/csp2.419.

56 A.-L. Chaber, S. Allebone-Webb, Y. Lignereux, A.A. Cunningham and J.M. Rowcliffe, 'The scale of illegal meat importation from Africa to Europe via Paris', 3 *Conservation Letters* (2010) 317–321, doi: 10.1111/j.1755-263X.2010.00121.x; A.-L. Chaber, G.K. Moloney, V. Renault, S. Morrison-Lanjouw, M. Garigliany, L. Flandroy, D. Pires, V. Busoni, C. Saegerman and P. Gaubert, 'Examining the international bushmeat traffic in Belgium: A threat to conservation and public health', 17 *One Health* (2023) 100605, doi: 10.1016/j.onehlt.2023.100605.

57 *Ibid.*

58 G.K. Moloney, K.J. Gosse, S. Gonedele-Bi, P. Gaubert and A.-L. Chaber, 'Is social media the new wet market? Social media platforms facilitate the online sale of bushmeat in West Africa', 16 *One Health* (2023) 100503, doi: 10.1016/j.onehlt.2023.100503.

59 Jacobs, *supra* note 43.

60 S. Heinrich, J. Ross and P. Cassey, 'Of cowboys, fish and pangolins: US trade in exotic leather', 1 *Conservation Science and Practice* (2019) e17, doi: 10.1111/csp2.75.

The survey of the online operating environment and threat elements shows that the internet is a medium which exacerbates the risks to pangolins. For the operationalization of ecocide, the use of the internet can have counter-veiling impacts, on the one hand adding a layer of anonymity to perpetrators, but on the other creating a record of their transactions which is generally retrievable and durable. Additionally, medical studies revealing a lack of any clear benefits derived from ingesting pangolin scales would be of potential relevance for assessing the gravity of their exploitation, as addressed below.

2.5 *Pangolin Trafficking Incidents*

Turning to the data on pangolins, at the macro-level, all eight species of pangolins are illegally harvested from the wild in considerable numbers for their meat and scales to be sold on the black market.[61] Pangolin seizures provide a critical source of data. According to the IUCN SSC Pangolin Specialist Group, there have been approximately one million pangolins poached from the wild and trafficked in the past decade due to increasing consumer demand, which is equivalent to one pangolin every five minutes (Figure 2). Pangolins are frequently hunted in Western regions of Africa, mainly Uganda, Nigeria and Cameroon, with an average hunter in a local community catching between 1 to 20 pangolins each day. It is estimated that since 2012, 20 000 kg of African pangolin scales have been seized either in Africa, Asia or Europe, which is equivalent to between 5000 and 30 000 animals.[62] However, this is underrepresentative, as not all trades are seized and not all seizures are recorded.[63] Enforcement endeavours are further compromised by low prosecution rates, where only 1.4% of recorded seizures result in successful convictions. This reflects the overburdened judicial system where wildlife cases can take 10 years to reach a conclusion. Consequently, the data is likely to underestimate the actual scale of trafficking, highlighting the imperative to investigate pangolin exploitation.[64]

The situation of Indian and Chinese pangolins demonstrates their precarity. Both suffered decades of severe hunting and trade for their meat, causing a

61 Challender, *supra* note 3.

62 IUCN SCC Pangolin Specialist Group, *Massive seizure of African Pangolin Scales in Hong Kong* (IUCN, Gland, 2016), available online at https://pangolinsg.org/2016/06/27/massive-seizure-of-african-pangolin-scales-in-hong-kong/ (accessed 2 February 2025).

63 W. Cheng, S. Xing and T.C. Bonebrake, 'Recent Pangolin Seizures in China Reveal Priority Areas for Intervention', 10 *A Journal of the Society for Conservation Biology* (2017) 757–764, doi: 10.1111/conl.12339.

64 L. Gomez, T. Joseph, S. Heinrich, B. Wright and N. D'Cruze, 'Illegal trade of pangolins in India with international trade links: An analysis of seizures from 1991 to 2022', 69 *European Journal of Wildlife Research* (2023) 85, doi: 10.21203/rs.3.rs-2676540/v1.

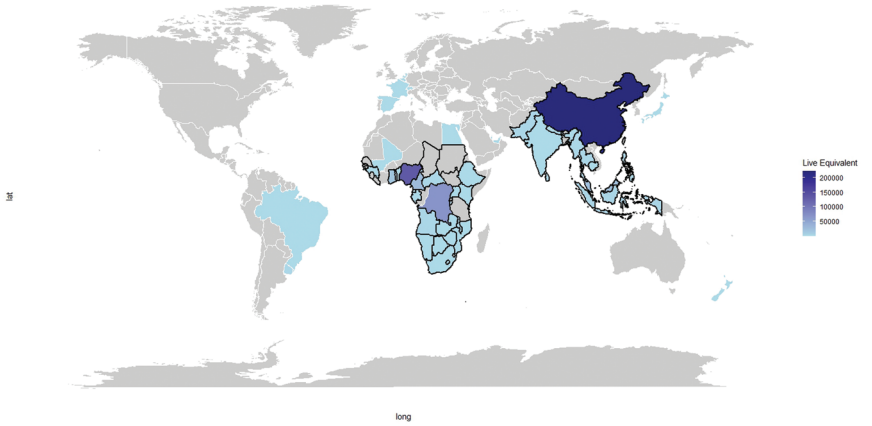

FIGURE 2 Geographical heat map displaying the total number of (live equivalent) pangolins seized between 2002 and 2019 in either a source and/or destination country as made available on the UNODC World WISE Database.[65] The top 3 origin countries were Nigeria (131 450), Democratic Republic of the Congo (65 358) and Cameroon (26 827). The top 3 destination countries were China (221 843), Viet Nam (58 487) and Lao People's Democratic Republic (9610). This is excluding 127 001 and 245 412 unknown destination and origin country seizures, respectively. The darker outlined country borders represent the known pangolin home range countries according to the IUCN Red List.

sharp decrease in their population sizes. Despite having the highest protection classification under Indian law, authorities seized a total of 6000 pangolins between 2009 and 2017.[66] The exact number may far exceed reported results, as a large proportion of illegal trade goes unreported. As a part of the complex trading network between Asia and Africa, all four Asian species (Indian, Sunda, Philippine and Chinese) are involved in the Indian market.[67]

A 2023 study of records, literature and verified public media from 2010 to 2020 shows that in 27 districts of Nepal, a hub for international pangolin trade, 122 pangolin seizures were reported, with Kathmandu the main trading hub. The seizures included 23 live pangolins, 18 whole body skins with scales, 300 kg of dry meat and 1046.7 kg of scales. An overall 1500 individuals were hunted. Seizures were recorded of pangolin scales traded internationally from Nigeria

65 United Nations Office on Drugs and Crime (UNODC),' Wildlife Trafficking' (2024), available online at https://dataunodc.un.org/dp-wildlife-seizures-origins-trends.

66 A. Vikram, R. Goswami, A. Mendis and R. Roopa, 'Scale of the issue: Mapping the impact of the COVID-19 lockdown on pangolin trade across India', 257 *Biological Conservation* (2021) 109136, doi: 10.1016/j.biocon.2021.109136.

67 Gomez, *supra* note 64.

to Nepal and destined for markets in China. People who were arrested in Nepal, originally from India, were connected to trades from Bhutan going to Nepal.[68]

The destination of most scales are countries in Asia, mainly China and Vietnam which make up 70.9 and 18.7% of the export destinations, respectively.[69] The growing pangolin market in China has demanded approximately 200 000 individual pangolins per year. A literature review of recent pangolin seizures in China reported 65 849 animals in 206 seizures from 2008 to 2016.[70] In June 2016, Hong Kong authorities seized 4 tonnes of pangolin scales originating from Cameroon, Africa. Estimated between 1100 and 6600 African pangolins, this shipment was one of the largest seizures of African pangolin scales with an estimated value of $1.25 million USD on the black market.[71] In 2024, Nigerian Customs seized 9493.8 kg of pangolin scales, which has been estimated to represent the following numbers of animals killed, based on species: the black-bellied pangolin is estimated to be 3262 individuals (95% Confidence Interval (CI): 1602–6944); the *Smutsia* species is estimated to be 839 individuals (95% CI: 521–1171); and the white-bellied pangolin is estimated to be 35 752 individuals (95% CI: 29 621–40 973). These figures underscore the scale of illegal pangolin trade and the significant number of pangolins killed annually to meet the demand for their scales. There is a significant and persistent demand for pangolin scales in Asia, driven by their perceived medicinal, cultural, and social status value, further fueling the illegal trade.

This survey of the conventional aspects of pangolin exploitation yields multiple insights of relevance for the potential prosecution of ecocide. First, there is a vacillation between specific and measurable reported instances of harms to pangolins, such as seizures of living or deceased individuals and their parts, and generalized estimates of harms. Thus a figure of 20 000 kg of pangolin scales seized could equate to anywhere between 5000 and 30 000 individuals. The variation in the nature and certainty of the data will require legal bodies to be aware of this volatility when utilizing as evidence in criminal proceedings, as discussed below. Second, the multi-causal nature of pangolin related-harms will necessitate detailed perpetrator selection. For example, rural communities relying on pangolin hunting for survival present a different scenario to internationally-operating criminal organisations, with the former

68 Suwal, *supra* note 28.

69 United Nations Office on Drugs and Crime (UNODC), 'World Wildlife Crime Report 2020' (UN, New York, NY, 2020), available online at https://www.unodc.org/documents/data-and-analysis/wildlife/2020/WWLC20_Chapter_4_Pangolin.pdf (accessed 2 February 2025).

70 Cheng, *supra* note 63.

71 IUCN SCC Pangolin Specialist Group, *supra* note 62.

less likely to be considered those "most responsible"[72] referring to the following factors "the nature of the unlawful behaviour; the degree of their participation and intent; the existence of any motive involving discrimination; and any abuse of power or official capacity"). Third, the tracking of cross-border movements of pangolins is relevant to the 'widespread' element of ecocide, which most leading definitions include,[73] as addressed below.

3 Defining Ecocide in its Broader Context

> It is our job to ensure that destroying nature becomes a crime. It won't just be the law that changes then, but the whole course of history
>
> POLLY HIGGINS.

The contours of the ICC's newest proposed crime—ecocide—have not yet been settled, and considerable questions persist as to how it will be prosecuted. Nonetheless, the broad parameters of ecocide as a legal concept are taking shape. In a non-legal sense the word 'ecocide' is used to denote *destruction or damage of the environment, especially when reckless or intentional*.[74] The term was initially coined in the 1970s to describe the scope of environmental destruction as a consequence of herbicides and defoliants used in Vietnam during the Vietnam War.[75] It has since been suggested that ecocide should be classified as a mass atrocity crime within the jurisdiction of the ICC, alongside genocide, war crimes, crimes against humanity and aggression.[76] The precise

72 See Regulation 34(1) of the Regulations of the Office of the Prosecutor (2009) and the policy paper on case selection and prioritization (Office of the Prosecutor, *Policy paper on case selection and prioritization* (International Criminal Court, The Hague, 2016), available online at https://www.icc-cpi.int/itemsDocuments/20160915_OTP-Policy_Case-Selection_Eng.pdf, para. 43 (accessed 2 February 2025).

73 Independent Expert Panel for the Legal Definition of Ecocide, *Commentary and Core Text* (Stop Ecocide, Stroud, 2021), available online at www.stopecocide.earth/expert-drafting-panel; Gillett, *supra* note 5.

74 Oxford English Dictionary, *Ecocide* (Oxford University Press, Oxford, 2008), available online at www.oed.com/dictionary/ecocide_n?tl=true.

75 Jer, *supra* note 19; D. Zierler (ed.), *Invention of ecocide: Agent Orange, Vietnam, and the scientists who changed the way we think about the environment* (University of Georgia Press, Atlanta, GA, 2011).

76 International Criminal Court, *The United Nations Rome Statute of the International Criminal Court* (ICC, The Hague, 2021), available online at https://www.icc-cpi.int/sites/default/files/2024-05/Rome-Statute-eng.pdf/, Articles 5–9 (accessed 2 February 2025);

formulation of ecocide which is adopted will have significant ramifications for the range of conduct that is criminalised and the legitimacy of any verdicts issued pursuant to its terms.

One leading definition of ecocide is that of the Independent Expert Panel (IEP). It defines ecocide as 'unlawful or wanton acts committed with knowledge that there is a substantial likelihood of severe and either widespread or long-term damage to the environment being caused by those acts'.[77] Although it does not mention animals in its pithy formulation of the crime of ecocide, and in fact has no enumerated underlying acts, it does include reference to animals in its definition of 'widespread', which it denotes as including damage which is 'suffered by an entire ecosystem or species'.

Conversely, the definition formulated by Gillett (an author of this piece) explicitly encompasses harm to animals as underlying acts of ecocide, providing:

(1) Ecocide means wilfully[78] committing any of the following acts and thereby causing[79] severe damage to the natural environment[80] that is also widespread or long-term:[81]

Global Centre for the Responsibility to Protect (GCRP), *Defining the Four Mass Atrocity Crimes* (GCRP, New york, NY, 2018), www.globalr2p.org/publications/defining-the-four-mass-atrocity-crimes/ (accessed 2 February 2025).

77 Independent Expert Panel for the Legal Definition of Ecocide, *supra* note 73. *See also* the clarifications of the meaning of some of these terms in the Commentary that accompanies the Core Text.

78 Wilfulness, in this context, encompasses direct intent, as in purpose or virtual certainty regarding the environmental harm, as well as voluntarily assuming the risk of such harm occurring, when undertaking the underlying act. A person who genuinely takes appropriate and available measures designed to avoid environmental harm is not wilfully accepting the risk of environmental harm and therefore would not meet this element of the crime.

79 Whereas some versions of ecocide, and the war crime in Article 8(2)(b)(iv), are formulated inchoately (not requiring the environmental damage to actually occur, but only that the acts involve a risk of environmental harm), the formulation proposed herein requires a result to be shown. Requiring a result ensures that only the most serious instances of environmental harm constitute ecocide. Nonetheless, if a person takes action that commences the execution of ecocide by means of a substantial step, but the crime does not occur because of circumstances independent of the person's intentions (other than the person's abandonment of the effort to commit the crime, or prevention of the commission of the crime, as long as the person completely and voluntarily gave up the criminal purpose), the accused may nonetheless be liable for attempting to commit ecocide, under Article 25(3)(f).

80 The term 'natural environment' can be defined in accordance with the definition of the ILC.

81 The terms 'widespread', 'long-term', and 'severe', are drawn from API, Articles 35(1) and 55(2), as well as the 1991 Draft Code of Crimes Against the Peace and Security of Mankind,

(a) killing, harming, or removing protected flora or fauna;[82]
(b) destroying or damaging ecosystems or wild animal habitats;[83]
(c) destroying or damaging natural heritage;[84]
(d) trafficking or dumping hazardous substances;[85]
(e) releasing, emitting, or introducing harmful quantities of substances or energy into the air, water, or soil;[86]
(f) causing or contributing to the large-scale emissions of greenhouse gases or the destruction of greenhouse gas sinks or reservoirs;[87]
(g) any other acts of a similar character, where those acts involve unsustainable harm to the natural environment.[88]

Article 2, the Rome Statute, Article 8(2)(b)(iv), and are also found in the 1981 Conventional Weapons Convention, the ICJ's nuclear weapons decision, and the ICRC customary law study. Various interpretations have been given to these terms in those contexts, as discussed above (particularly in relation to the war crime under Article 8(2)(b)(iv) of the Rome Statute and the ENMOD Convention). Sub-paragraph 3 of the definition below further explains the role of these qualifiers.

82 This provision draws on the Convention on International Trade in Endangered Species of Wild Fauna and Flora (1973), which has over 180 State Parties and requires the domestic criminalization of its key prohibitions.

83 This provision draws on the Convention on Biological Diversity (1992), which has over 190 State Parties. Although the Biological Diversity Convention does not explicitly require the domestic criminalization of its key prohibitions, Article 8(k) requires State Parties to '[d]evelop or maintain necessary legislation and/or other regulatory provisions for the protection of threatened species and populations'.

84 This provision draws on the World Heritage Convention of 1972, which has over 190 State Parties. Under the Convention, States are obliged to do their utmost to protect natural heritage, including through legal measures: *e.g.*, Article 4 and Article 5, though it does not explicitly require the domestic criminalization of its key prohibitions.

85 This provision draws on the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (1989), which has over 170 State Parties and requires the domestic criminalization of its key prohibitions.

86 This provision draws on *inter alia* the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (1972), which has over eighty States Parties, and its 1996 Protocol; the Convention on Prevention of Pollution from Ships (1973), which has over 150 State Parties, and its 1978 Protocol; the Convention on Long-Range Transboundary Air Pollution (1979), which has over fifty States Parties; the Montreal Protocol on Substances that Deplete the Ozone Layer (1989), which has 197 State Parties; and the EU Directive on the Protection of the Environment through Criminal Law (2008). Several of these instruments and provisions require domestic criminalization, such as the 1989 Montreal Protocol.

87 This provision draws on *inter alia* the UN Framework Convention on Climate Change (UNFCCC), which has over 190 States Parties.

88 The term 'unsustainable' may draw on principles of environmental law such as weighing social and economic benefits, the precautionary principle, the preventive principle, the 'polluter pays' principle, intergenerational equity, and common-but-differentiated responsibilities attributed to developing countries.

(2) Irrespective of whether it qualifies as any of the acts listed in paragraph 1, conduct shall not be considered ecocide if it is both (a) strictly in accordance with international law, particularly international environmental law, and (b) authorized by a competent national authority.
(3) In order to fulfil the definition in paragraph 1, the damage to the natural environment must be severe, while also being either widespread or long-term (or both). Consequently, in all cases the anticipated damage must be severe, but no one of the qualifiers can be significant enough on its own to satisfy the definition of ecocide. Moreover, the severe, widespread, and/or long-term nature of the harm may be established on the totality of the conduct at issue, which may include multiple underlying acts.
(4) The terms of paragraph 1 shall be interpreted in accordance with international law, particularly environmental law.

Yet even with this enumerated version of ecocide, the specific contours of the underlying acts designed to protect wildlife will require elaboration, just as underlying acts of crimes against humanity such as forcible displacement and torture have been developed in the jurisprudence.

Although ecocide has not yet been adopted as a crime at the international level, several domestic legal systems list ecocide in their penal provisions.[89] Recently, the European Union issued a Directive calling for member States to criminalise ecocide, which has seen several domestic moves towards adopting the crime. Particularly notable is Belgium which now has a version of ecocide incorporated into Article 94 of its Federal Criminal Code.[90] Moreover, serious environmental harm can be prosecuted under existing international crimes, including war crimes and crimes against humanity. This can apply both during and outside of wartime (crimes against humanity such as forced displacement and persecution can be committed through environmental destruction in peacetime; as set out in allegations submitted to the ICC concerning deforestation in the Amazon, for example).[91] Courts such as the Colombian

89 A. Gauger, M. P. Rabatel-Fernel, L. Kulbicki, D. Short and P. Higgins, *The Ecocide Project: Ecocide is the Missing 5th Crime against Peace* (Human Rights Consortium, School of Advanced Study, University of London, Lomdon, 2013), available online at https://sas-space.sas.ac.uk/4830/1/Ecocide_research_report_19_July_13.pdf (accessed 2 February 2025); Gillett, *supra* note 5.

90 It formulates ecocide as "deliberately committing, by act or omission, an illegal act causing serious, widespread and long-term damage to the environment in the knowledge that this act is causing such damage, provided that this act constitutes an infringement of federal legislation or an international instrument that is binding on the federal authority or if the act cannot be located in Belgium".

91 *See, e.g.*, Climate Counsel, Greenpeace Brasil, Observatorio do Clima, *ICC Communication: Crimes Against Humanity in Brazil: 2011 to the Present*, 9 November 2022.

Special Jurisdiction for Peace (JEP) are already prosecuting environmental harm,[92] and the ICC has signalled its strong interest in doing the same.[93] These moves demonstrate a legal basis to adopt the crime of ecocide and an expanding number of pathways and precedents for the application of international criminal law to serious environmental harm. Given the range of legal definitions available, insights from other disciplines are apposite to examine the contours of the notion and elements of ecocide.

It must be noted that, at the international level, the most directly applicable body for cross-border environmental harms is not criminal law but environmental law (which in this instance also encompasses elements of transnational law). A leading instrument covering the movement and trade of wildlife is the Convention on the International Trade in Endangered Species (CITES). Pangolins were added to Annex 1 (most at risk) of CITES from 2016, but were still harvested in large numbers thereafter.[94] Almost all States are parties to this treaty. CITES restricts the trade of species listed under its three annexes, subjecting them to escalating controls in line with their assessed level of endangerment, and requires State Parties to cooperate in suppressing this activity. Importantly, it requires States to penalize the trade or possession of protected species (Article VIII(1)). CITES can be used for prosecutions of animal trafficking at the domestic level and can potentially provide a basis for trade restrictions, which are permissible for the interests of environmental protection under the World Trade Organisation key instruments.[95] However, it does not establish any cross-jurisdictional institutional architecture for enforcing its provisions; instead leaving it to States to do so within their domestic structures.

Beyond the CITES treaty there are other relevant instruments, such as the Convention on Biological Diversity of 1992,[96] and principles, such as the precautionary principle, which are linked to the obligations on States regarding the protection of species such as the pangolin. Whereas these legal instruments

92 República De Colombia, Jurisdicción Especial Para La Paz (JEP), Salas de Justicia Sala de Reconocimiento de Verdad, de Responsabilidad y de Determinación de Los Hechos y Conductas, Caso 5, Auto, Srvr, No. 001 de 2023 (JEP: Macro Case No. 5 Decision of 1 February 2023).

93 ICC: Prosecutor Karim Khan, *Statement on Environmental Policy* (16 February 2024), available online at https://www.icc-cpi.int/news/office-prosecutor-launches-public-consultation-new-policy-initiative-advance-accountability-0.

94 Mackintosh, *supra* note 4.

95 *See* GATT, Article XX; Report of the appellate body on United States—Import Prohibition of Certain Shrimp and Shrimp Products, WT/DS58/AB/R, October 12, paras 165–166.

96 *See* S. Negri, 'On Meteors and Comets: Is the Crime of Ecocide Back to Stay? Environmental Crimes at the Interface of Philosophy, the Law of State Responsibility and International Criminal Law', 23(1) *International Criminal Law Review* (2023) 145–174, at p. 151.

provide complementary legal options for redress, they do not involve individual criminal responsibility at the international level. In this light and given the multiple calls for ecocide and other international environmental crimes to redress harm to animal species, it is apposite to review the potential use of the ICC to redress pangolin trafficking as a case study for other ecocentric harms.

4 Superimposing the Legal Analysis Onto the Ecological Data

As the preceding section illustrates, ecological science (along with branches such as conservation/biodiversity studies and animal welfare science)[97] demonstrates that pangolins face multiple threats to their well-being and existence. That data is critical for the application of several of the legal elements of ecocide (and other environmental crimes), as set out forthwith.

4.1 *Widespread and Long-Term*

Two elements of ecocide, which are present in the major formulations of the crime, are widespread and long-term harm to the environment.[98] These elements are posed disjunctively, so that the presence of either in addition to the 'severe' element would be sufficient to establish ecocide (subject to the intent and additional elements being demonstrated). Both elements are also present in Article 8(2)(b)(iv), the only provision of the Rome Statute which mentions the environment.

The term 'widespread' denotes the required geographical scope of the environmental damage.[99] The ENMOD Convention defines 'widespread' as several hundred square kilometres.[100] The ICRC Commentary to the Additional Protocol I to the Geneva Conventions suggested by commentators thousands of square kilometres.[101] Cross-border movements of pangolins could be dispositive of the 'widespread' requirement, which most leading definitions include.[102]

97 G. Futhazar, 'Biodiversity, Species Protection, and Animal Welfare Under International Law', in A. Peters (ed.), *Studies in Global Animal Law*, 1st edn. (Springer, Berlin, 2020), pp. 95–108.

98 Independent Expert Panel for the Legal Definition of Ecocide, *supra* note 73; Gillett, *supra* note 5.

99 But see the idiosyncratic definition of widespread provided by the IEP outlined above.

100 Understanding I, ENMOD Memorandum of Understanding.

101 ICRC Commentary of 1987, 'Protection of the Natural Environment'; I. Peterson, 'The natural environment in times of armed conflict: A concern for international war crimes law?', 22 *Leiden Journal of International Law* (2009) 325–343, at pp. 331–332, doi: 10.1017/S0922156509005846.

102 Independent Expert Panel for the Legal Definition of Ecocide, *supra* note 73; Gillett, *supra* note 5.

'Long-term' refers to the temporal duration of the environmental harm.[103] The ENMOD Parties agreed that the corresponding term used in that convention ('long-lasting' in Article 1) refers to a period of several months or a season.[104] Conversely, the 'long-term' duration required in Articles 35(3) and 55 of Additional Protocol I has been interpreted to mean a period of years, or even decades.[105]

The judicial assessment of both these terms will be assisted by reference to scientific studies providing indicia of the territorial and temporal ambit of the offending conduct. For example, a risk of extinction of pangolin species would be relevant for establishing the 'long-term' nature of the harm. Detailed population trend estimates may be required to show the duration of the harm to a particular species and the likely time required to replenish the population, but it is likely those would demonstrate sufficiently protracted harm. To the extent the criminal acts threatened actual extinction, the harm would be permanent, automatically qualifying as long-term. In these ways, scientific data will assist the application of the value labels of long-term and widespread.

4.2 *Gravity and Severity*

Alongside the putative crime of ecocide, there are several existing war crimes and crimes against humanity which have been used to prosecute environmental harm, and could potentially address wildlife exploitation. The elements of each of those existing crimes differ,[106] but will be subject to several cross-cutting issues, including gravity; causation; intent; and linkage between the crime and the perpetrators. These points are addressed in turn.

To justify investigating, and eventually prosecuting, crimes against the environment, the Rome Statute requires that a case be of 'sufficient gravity' to be admissible before the Court.[107] Alongside gravity, there is a severity

103 Gillett, *supra* note 5.

104 *See* Understanding relating to Article 1, ENMOD Memorandum of Understanding.

105 M. Schmitt, 'Green war: An assessment of the environmental law of international armed conflict', 22 *Yale Journal of International Law* (1997) 1–109; United Nations, *Final Report to the Prosecutor by the Committee Established to Review the NATO Bombing Campaign Against the Federal Republic of Yugoslavia* (UN, New York, NY, 2000), available online at https://www.icty.org/x/file/Press/nato061300.pdf, para. 15 (accessed 2 February 2025); United Nations General Assembly, Report of the Secretary-General on the Protection of the Environment in Times of Armed Conflict, 29 July 1993 (A/48/269), available online at https://digitallibrary.un.org/record/158808?ln=en&v=pdf (accessed 2 February 2025).

106 T. Weinstein, 'Prosecuting attacks that destroy the environment: Environmental crimes or humanitarian atrocities?', 17 *Georgetown International Environmental Law Review* (2005) 697–722.

107 ICC, *supra* note 76, Article 17(1)(d) and Article 53. ICC, The Prosecutor v. Al Hassan Ag Abdoul Aziz Ag Mohamed Ag Mahmoud, ICC-01/12-01/18 OA, Appeals Chamber, 'Judgment on the appeal of Mr Al Hassan against the decision of Pre-Trial Chamber I

requirement which will typically feature in specific international offences. For the crime of ecocide, severity is a consistent element among the leading proposed formulations.[108] A severity threshold is particularly important for distinguishing criminal attacks on the environment from the environmental impact that everyday productive and lawful activities may entail.[109]

Gravity is shown by various factors including the scale of the alleged crimes, their nature, manner of commission and impact.[110] Whilst anthropocentric considerations have been predominant to date,[111] the criteria are sufficiently flexible to encompass ecocentric harms, which would in turn be informed by ecological data.[112] In particular, data showing the risk of the extinction of a species, would be extremely relevant to the Court's assessment of gravity.[113]

Regarding the severity criterion, the term 'severe' refers to the intensity of the harm caused to the environment.[114] The assessment of severity may encompass the direct environmental harm caused by the attack (or act) as

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entitled "Décision relative à l'exception d'irrecevabilité pour insuffisance de gravité de l'affaire soulevée par la défense"' (19 February 2020).

108 Gillett, *supra* note 5; Independent Expert Panel for the Legal Definition of Ecocide, *supra* note 73.

109 M. Gillett, 'A Tale of Two Definitions: Fortifying Four Key Elements of the Proposed Crime of Ecocide', *Opinio Juris* (2023), available online at https://opiniojuris.org/2023/06/20/a-tale-of-two-definitions-fortifying-four-key-elements-of-the-proposed-crime-of-ecocide-part-i/.

110 ICC: OTP Policy on Case Selection 2009, *supra* note 72.

111 ICC: 'Situation on Registered Vessels of Comoros, Greece and Cambodia', Article 53(1) (2014), available online at https://www.icc-cpi.int/sites/default/files/iccdocs/otp/OTP-COM-Article_53(1)-Report-06Nov2014Eng.pdf, para. 136 (accessed 2 February 2025); International Criminal Court (ICC), 'Final decision of the Prosecutor concerning the 'Article 53(1) Report' (ICC-01/13-6-AnxA)', dated 6 November 2014, as revised and refiled in accordance with the Pre-Trial Chamber's request of 15 November 2018 and the Appeals Chamber's judgment of 2 September 2019 (ICC-01/13-99-Anx).

112 Gillett, *supra* note 5.

113 L. Berat, 'Defending the right to a healthy environment: Toward a crime of geocide in international law', 11 *Boston University International Law Journal* (1993) 327–343; F. Bianchini, P.G. Diaz, J. Holt, P. Martini, M. Sarlieve and R. Stuart-Smith, *Comment on OTP environmental crimes policy* (2024), available online at https://www.smithschool.ox.ac.uk/sites/default/files/2024-03/20240316_Comment_on_OTP%20Environmental_Crimes_Policy_Sarlieve_et_al.pdf (accessed 2 February 2025); R. Pereira, 'After the ICC Office of the Prosecutor's 2016 policy paper on case selection and prioritisation: Towards an international crime of ecocide?', 31 *Criminal Law Forum* (2020) 179–198, doi: 10.1007/s10609-020-09393-y; United Nations General Assembly, Tackling illicit trafficking in wildlife, 19 August 2015 (Resolution 69/314), available online at https://documents.un.org/doc/undoc/gen/n15/238/62/pdf/n1523862.pdf (accessed 2 February 2025).

114 Gillett, *supra* note 5.

well as its secondary effects. Indeed, discussions of the term severe in Article 35(3) of Additional Protocol I (the precursor provision on which the term 'severe' is based in Article 8(2)(b)(iv) of the Rome Statute and in the proposed definitions of ecocide) indicate that it was meant to refer to 'damage of a nature to significantly disrupt an ecosystem'.[115] This was considered to exclude 'cutting or destruction of trees and cratering as a result of normal artillery fire', as well as the 'flattening of a "clump of trees"', as falling below the threshold.[116]

In relation to the pangolin, ecological data showing the extent of the harm to the species and to the surrounding ecosystem(s), will be important factors in determining whether the gravity and severity thresholds have been met. Additionally, the way in which the harm was inflicted will factor into assessments of gravity. Looking to the example of the pangolin, there are three levels at which the potential harm can be conceptualized.

First, harm to *individual* pangolins can be tallied as part of the assessment of the magnitude of the harm to the environment. Although trafficking a couple of dozen pangolins is unlikely to be sufficiently grave, trafficking thousands may well be. Nonetheless, adjudicators may be reluctant to view the death of non-human entities as similarly serious as the death of humans.[117] If particular cruelty and violence is used in the capture, detention and handling of pangolins, then this can be incorporated into the assessment of the nature of the harm caused at this level. From welfarist and individual animal rights perspectives, the suffering of specific animals can be considered significant, even if the survival of the species is not threatened.[118]

Second, at the *species* level, the threat of extinction will augur in favour of finding sufficient severity. The pangolins presence on the IUCN red list would carry heavy weight with the ICC, given that the IUCN is an inter-governmental organisation. Even a relatively minimal loss of furtive animals like pangolins can exacerbate the 'empty forest' phenomena, which sees pangolins struggle to find mates to reproduce. The impact on a severely declining pangolin species would, all other matters being equal, be considered a more serious harm than against a population which is growing; reflecting a conservationist approach.[119]

115 International Committee of the Red Cross (ICRC), *Guidelines on the protection of the natural environment in armed conflict: Rules and recommendations relating to the protection of the natural environment under international humanitarian law* (ICRC, Geneva, 2020), available online at https://www.icrc.org/en/publication/4382-guidelines-protection-natural-environment-armed-conflict, para. 68 (accessed 2 February 2025).

116 *Ibid.*

117 *Ibid*, para. 50.

118 *See generally* Lostal *et al.*, *supra* note 17.

119 *Ibid.*

By implication trafficking thousands of wild European rabbits (presuming they were not an endangered species of rabbits), even if done illegally, would not carry the same significance as the same action committed against a threatened species, such as the pangolin.

It will be important to differentiate between harms against wild pangolin populations and those in captivity (though mistreatment of pangolin in captivity can also constitute a form of environmental harm). In this respect, investigators will have to be cognizant of the risk of captive breeding being used to disguise the trafficking of wild pangolin.

Third, there is the *broader impact* on the natural environment which would arise from the disappearance of pangolins.[120] Pangolins play important roles in the ecosystem, as they regulate insect populations, such as ants and termites, which helps prevent the destruction of forests, their burrows support biodiversity by providing shelter to other species, and their burrowing also assists in soil aeration and the nutrient cycle.

Measuring anthropogenic impact on broader systems is already a facet of environmental regimes designed to operate across borders. For example, the EU Water Framework Directive[121] sets out scientific criteria for establishing and classifying ecological status. Human-caused harms must show at most a low-level of distortion to the biological, physico-chemical and hydro-morphological qualities of the body of water in question.[122] Ecological models are 'decisive' in establishing whether the impact will be excessive and thereby whether the permit can be granted.[123]

When it comes to ecocide, there are no specific quantitative measures to determine whether a harm is excessive at the individual, species, or ecosystem level. Nonetheless, a similar approach to the EU Water Framework, distinguishing between anthropogenic and other forms of harm, could be adapted to match the elements of ecocide. Presuming that a severe level of harm would have to be shown, there are clear-cut cases, such as killing the last individuals of the species remaining in existence in the wild, which is a risk for the Northern White Rhinoceros. However, for many species, the

120 See Section 2, Broader Impacts.

121 The European Parliament And The Council Of The European Union, *EU Water Framework Directive*, 2000/60/EC (2000), available online at https://eur-lex.europa.eu/eli/dir/2000/60/oj (accessed 2 February 2025).

122 *Ibid*, Annex V; H. Thorén, N. Soininen and N. Kotamaki, 'Scientific models in legal judgements: The relationship between law and environmental science as problem-feeding', 124 *Environmental Science and Policy* (2021) 478–484, doi: 10.1016/j.envsci.2021.07.018.

123 *Ibid*.

risk of extinction will be contingent on the scale of the trafficking. Utilising standardized approaches analogous to the EU Water Framework Directive will assist to ensure consistent and defensible findings and verdicts are reached regarding culpability for harms to animals.

However, impact assessments based on environmental modelling can incorporate, and potentially introduce, a high level of uncertainty.[124] Various factors exacerbate this epistemic uncertainty, including the complexity of the model structure, the spatio-temporal scale used, the availability of high quality data, and the approximation and estimates of numbers.[125] Making those factors accessible for adjudicative fact-finders will be essential for the ability to test the evidence and understanding its epistemic underpinnings.

In any legal proceedings for ecocide or another environmental crime based on pangolin trafficking, this analysis would be open to challenge. The burden of proof falls on the prosecution to establish its case beyond reasonable doubt on the basis of evidence. The defence has statutory rights to challenge incriminating witnesses, to time and facilities to prepare a defence, and to not to have the burden of proof reversed or any onus of rebuttal.[126] Incorporating ecological approaches must be matched with accommodations to both parties to ensure equality of arms, particularly through access to underlying data.

Declines in pangolin numbers can be multi-factorial. Even the anthropogenic proportion may be divided between multiple parties ranging from rural inhabitants to organized criminal groups. An accused may query whether the decline in a population can be attributed to declines in birth rates for reasons other than the specific trafficking subject to charges. Identifying and attributing specific contributions would be difficult and largely contingent on the availability of evidence regarding the specific number of pangolins which the accused trafficked. Estimations will typically be required, which will create further space for legal challenges. In litigating these challenges is essential that judicial actors understand the limitations of the data in reaching their conclusions and entering verdicts.

Two points can be made at this juncture. First, demonstrating the risk of extinction is not a necessary element to establish gravity and severity *per se*. Second, extinction risk is inherently probabilistic. The adjudicators should not impose a binary standard, consisting of either extinction or existence, but instead should look to whether the conduct created a serious risk of

124 K. Popper (ed.), *Conjectures and refutations: the growth of scientific knowledge* (Routledge & Kegan Paul, London, 1963); Thorén *et al.*, *supra* note 122.

125 Thorén *et al.*, *supra* note 122, p. 481.

126 Rome Statute, Article 67(1).

contributing to the extinction of the species, even if other factors may also influence the eventuality. That risk-based assessment is not incompatible with the standard of proof applied at the ICC. Rather than 'absolute certainty', the threshold is beyond *reasonable* doubt.[127] That means probabilistic assessments are a viable means of proving charges, even where they cannot ensure 100% statistical certainty.

In this light, the precautionary principle and the preventive principle, both customary principles of international environmental law, can be applied where appropriate, under Article 21(1)(b) of the Rome Statute.[128] Under the precautionary principle, where there are threats of serious or irreversible damage, a lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.[129] The closely related preventive principle requires a party engaging in conduct to ensure 'the prevention of damage to the environment, and otherwise to reduce, limit or control activities which might cause or risk such damage'.[130]

Such an intertwining of international criminal law and international environmental law is likely to be an inherent feature of any proceedings in which ecocide is charged, and may well feature in prosecutions for environmental harm under existing provisions.[131] Guidance from international environmental law can assist to provide a legal basis to interpret the law applied by the ICC in a supple and realistic manner, and to avoid the categorial exclusion of environmental harm from prosecutions due to its inherently probabilistic and multi-factorial nature.

4.3 *Causation*

From a legal perspective it is necessary to show that the accused's acts caused (or at least made a contribution to) a proscribed harm (there are forms of

127 *See* ICC: *The Prosecutor v. Mathieu Ngudjolo Chui*, ICC-01/04-02/12 A, Appeals Chamber, 'Judgment on the Prosecutor's appeal against the decision of Trial Chamber II entitled "Judgment pursuant to Article 74 of the Statute"', 7 April 2015, paras 105–118.

128 Gillett, *supra* note 5; ICC, *supra* note 76.

129 United Nations General Assembly, Rio Declaration on Environment and Development, 12 August 1992 (A/CONF.151/26 (Vol. I)), available online at https://www.un.org/en/development/desa/population/migration/generalassembly/docs/globalcompact/A_CONF.151_26_Vol.I_Declaration.pdf, Principle 15 (accessed 2 February 2025).

130 P. Birnie, A. Boyle and C. Redgwell (eds), *International Law and the Environment*, 3rd edn. (Oxford University Press, Oxford, 2009).

131 M. Gillett, 'The Kakhovka Dam and ecocide: A convergence of international criminal law, international humanitarian law, international environmental law, and international human rights law?', *Verfassungsblog* (2023), available online at https://verfassungsblog.de/the-kakhovka-dam-and-ecocide/ (accessed 2 February 2025).

culpability such as direct and public incitement to genocide under Article 25(3)(e) and superior responsibility under Article 28 of the Rome Statute, which arguably do not require any causation) and there are crimes of endangerment, which nonetheless require counter-factual causation assessments, as discussed below.[132] Regarding the standard of causation required, the ICC in *Lubanga* stated that, for co-perpetrator liability, it must be shown that the accused made 'an essential contribution with the resulting power to frustrate the commission of the crime'.[133] That means that the crime would not have occurred in the manner which it did but for the accused's contributions. For aiding and abetting liability, the international courts have held that a substantial contribution and for common purpose liability, a significant contribution is required.[134] Harm arising from causes unconnected with the accused's actions cannot be held against them.[135]

Insights from ecological studies of the pangolin population numbers point to multiple causes for the decline, most prominently habitat degradation and over-exploitation. In showing the causative relationship between an accused's actions and the impact on a pangolin population, the contributory factors would have to be identified and, to the extent possible, linked to the accused's conduct. However, this promises to be complex especially as it is and largely unprecedented for the prosecution of environmental harm under international criminal law.

From a scientific perspective, causation is a partially different analysis to that of legal causation.[136] Scientifically, causation is typically focused on the factual causes of an outcome, which can be termed the 'cause-in-fact'. Legally, the assessment has two facets—first, the 'cause-in-fact' and, second, the 'causative responsibility'.[137] Causative responsibility is a normative assessment. Although it is predicated on a defendant's actions being a factual cause of

132 ICC, *supra* note 72; M. Jackson, 'Causation and the legal character of command responsibility after Bemba at the International Criminal Court', 20 *Journal of International Criminal Justice* (2022) 437–458, doi: 10.1093/jicj/mqac018.

133 ICC: *Prosecutor v. Thomas Lubanga Dyilo*, ICC-01/04–01/06 A5, Appeals Chamber, Judgment on the appeal of Mr. Thomas Lubanga Dyilo against his conviction, 1 December 2014, para. 469.

134 M. Cupido, 'Common purpose liability versus joint perpetration: A practical view on the ICC's hierarchy of liability theories', 29 *Leiden Journal of International Law* (2016) 597–621, doi: 10.1017/S0922156516000364.

135 D. Palarczyk, 'Ecocide before the International Criminal Court: Simplicity is better than an elaborate embellishment', 34 *Criminal Law Forum* (2023) 147–207, doi: 10.1007/s10609-023-09453-z.

136 S. Steel (ed.), *Proof of Causation in Tort Law* (Oxford University Press, Oxford, 2015).

137 This is also known as the 'scope of responsibility' or 'proximate cause'; D. Ozonoff, 'Legal Causation and Responsibility for Causing Harm', 95 *American Journal of Public Health* (2005) S35–S38.

the harm to the victim, causative responsibility is not focused on the factual connection but instead on the value-laden question of whether the defendant's contribution to the harm is of a sufficient nature to attract liability. The test of sufficiency will vary according to the nature of the claim; in civil negligence claims, foreseeability is the fulcrum test, whereas in international criminal law, an essential contribution has been required for principal responsibility.

For ecocide as an international crime, causation will be a pivotal factor (even for endangerment formulations of ecocide, such as the IEP's approach, there will be a counter-factual assessment of whether the accused's had a 'substantial likelihood' of causing the prohibited harms).[138] However, recent international (or at least regional) human rights jurisprudence on environmental harm has confusingly intertwined the factual and value-based conceptions of causation.

In particular, the European Court of Human Right's recent *KlimaSeniorinnen* case on climate change set out a taxonomy of what is termed the four 'dimensions' of causation.[139] Whereas *KlimaSeniorinnen* concerned green house gas emissions, which is more amorphous than the endangerment of pangolins; both types of harm share the characteristic of being polycentric and combining both lawful and unlawful causal factors.

Under the first dimension, the Court determined that the link between GHG emissions and the consequent accumulation of GHG in the atmosphere was 'a matter of scientific knowledge and assessment'.[140] However, the Court mystified the assessment by noting the apparent breach of domestic laws under this dimension,[141] which is a legal rather than scientific factor.[142]

The Court conceptualised the second dimension as the 'link between the various adverse effects of the consequences of climate change, and the risks of such effects on the enjoyment of human rights', which it termed a legal question. However, this elides the degradation of living conditions and the risk to human rights, the latter of which is a mixed fact and value assessment. Moreover, the Court added a qualitative specification of a legal nature, referring to this element requiring 'sufficiently *severe* risks of such effects on individuals'.[143]

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138 See Gillett, *supra* note 109.

139 ECtHR: *Verein KlimaSeniorinnen Schweiz and Others v. Switzerland*, 53600/20, Grand Chamber, Judgment, 9 April 2024.

140 *Verein KlimaSeniorinnen Schweiz and Others v. Switzerland*, *supra* note 139, para. 425.

141 *Verein KlimaSeniorinnen Schweiz and Others v. Switzerland*, *supra* note 139, para. 428.

142 V. Stoyanova, 'KlimaSeniorinnen and the Question(s) of Causation', *Verfassungsblog* (2024), available online at https://blogs.law.columbia.edu/climatechange/2024/05/07/klimaseniorinnen-and-the-questions-of-causation/#:~:text=According%20to%20the%20court%2C%20there,to%20ensure%20the%20applicant's%20individual (accessed 2 February 2025).

143 *Verein KlimaSeniorinnen Schweiz and Others v. Switzerland*, *supra* note 139, para. 435.

Third, the Court assessed 'the link, at the individual level, between a harm, or risk of harm, allegedly affecting specific persons or groups of persons, and the acts or omissions of State authorities against which a human rights-based complaint is directed'. Here again, the question has a factual component (concerning the State's factual contribution to the harm) and legal elements, as signalled by the reference to the term 'omissions' which are conditional on the State's legal obligations.

The fourth dimension is the 'attributability of responsibility regarding the adverse effects arising from climate change […], given that multiple actors contribute to the aggregate amounts and effects of GHG emissions.'[144] While this is largely a legal assessment of attribution, the relative contributions by various actors is also a factually informed question.

Confusingly, the subsequent sub-headings in the Grand Chamber's *KlimaSeniorinnen* decision do not explicitly correspond to the four dimensions of causation and comingle factors relevant to various dimension without any apparent delineation, making it unclear if they are supposed to be elucidations of those elements or simply further discussion of the assessment in general.

When applied to the pangolin ecocide scenario, the ECtHR's discussion reveals helpful inflection points. For example, in relation to fact-finding and apportionment of responsibility, the ECtHR attached importance to the conduct breaching domestic law;[145] made reference to international standards on the effects of environmental pollution on individuals' rights;[146] paid heed to the findings of the IPCC in light of its 'comprehensive and rigorous methodology including in relation to the choice of literature, the process of review and approval of its reports as well as the mechanisms for the investigation and, if necessary, correction of possible errors in the published reports'[147] (noting the lack of challenge to these IPCC findings by the respondent or intervening States);[148] gave deference to findings of the domestic courts and other competent authorities (without being bound thereby);[149] confirmed that 'each State has its own share of responsibilities to take measures to tackle climate change [therefore] a respondent State should not evade its responsibility by

144 *Verein KlimaSeniorinnen Schweiz and Others v. Switzerland*, *supra* note 139, para. 435.
145 *Verein KlimaSeniorinnen Schweiz and Others v. Switzerland*, *supra* note 139, para. 428. *See also* S. Swann, 'How undercover sting outwitted pangolin traffickers', *BBC News* (16 August 2023), available online at https://www.bbc.com/news/world-africa-66375281 (accessed 2 February 2025).
146 *Verein KlimaSeniorinnen Schweiz and Others v. Switzerland*, *supra* note 139, para. 428.
147 *Verein KlimaSeniorinnen Schweiz and Others v. Switzerland*, *supra* note 139, para. 429.
148 *Verein KlimaSeniorinnen Schweiz and Others v. Switzerland*, *supra* note 139, para. 432.
149 *Verein KlimaSeniorinnen Schweiz and Others v. Switzerland*, *supra* note 139, para. 430.

pointing to the responsibility of other States';[150] and finally rejected the '"drop in the ocean" argument' on the basis that it is not applying a 'but for' test, and instead what is required is a counter-factual assessment of whether 'reasonable measures which the domestic authorities failed to take could have had a real prospect of altering the outcome or mitigating the harm.'[151]

Importantly, the ECtHR observed that '[t]he adverse effects on and risks for specific individuals or groups of individuals living in a given place arise from aggregate GHG emissions globally, and the emissions originating from a given jurisdiction make up only part of the causes of the harm' meaning that 'issues of individual victim status or the specific content of State obligations cannot be determined on the basis of a strict *conditio sine qua non* requirement'.[152] Instead, it held that 'the State's primary duty is to adopt, and to effectively apply in practice, regulations and measures *capable of mitigating* the existing and potentially irreversible, future effects of climate change'.[153]

At the broader normative level, two factors emerging from *KlimaSeniorinnen* have internal resonance for the law on ecocide. First, the European Court intertwined its factual determination of responsibility with legal notions concerning the obligations on States. Although the Court should have more transparently signalled when it was assessing factual matters and when it was applying value-based judgments to its factual determinations, the analysis shows that the Court's factual and value based assessments are inextricably connected, at least in the polycausal realm of climate change.

In the State-focused context of human rights litigation, it is unsurprising that normative standards are utilized to plug factual gaps, as States have assumed those obligations. However, the ultimate test set down by the Court to determine responsibility for GHG emissions (whether there were reasonable measures available which the domestic authorities failed to take and which 'could have had a real prospect of altering the outcome or mitigating the harm') will be difficult to transpose to the criminal context. This is because it derives from positive obligations—a central feature in human rights law, which, however, are not directly applicable in the context of individual criminal responsibility. Indeed, the major formulations of ecocide are framed in terms of conduct by the perpetrator rather than a failure to fulfill duties equitable to a State-level analysis, as set out above. In this light, the legal nature of causation for the purposes of ecocide can be enhanced in light of other Court's approaches,

150 *Verein KlimaSeniorinnen Schweiz and Others v. Switzerland, supra* note 139, para. 442.
151 *Verein KlimaSeniorinnen Schweiz and Others v. Switzerland, supra* note 139, para. 444.
152 *Verein KlimaSeniorinnen Schweiz and Others v. Switzerland, supra* note 139, para. 439.
153 *Verein KlimaSeniorinnen Schweiz and Others v. Switzerland, supra* note 139, para. 545.

such as the ECtHR's, but will require further elaboration to be effectively applied in international criminal proceedings and forensic 'short-cuts' through State's positive obligations will have to be linked to specific perpetrators. Nevertheless, a similar legal position on causation could be achieved through a leadership clause for ecocide similar to that required for the crime of aggression under Article 8bis of the Rome Statute, limiting liability to those in a position to direct, control, or significantly influence the conduct of a State or similar organisation (this is adjusted from the aggression leadership element to reflect that environmental crimes do not require a State act).

Second, the use of 'international standards' indicates that harmonization of the principles and application of international law across domains is increasingly essential. Both considerations augur in favour of a definition of ecocide which is explicit and detailed regarding the proscribed conduct (with underlying acts preferably enumerated to allow for specific directions to be given to scientists assessing the potentially relevant environmental harm), as well as one which builds on and incorporates existing international law, such as the 'Gillett' definition of ecocide set out in full above. Conversely, the broad and unenumerated definition proposed by the Independent Expert Panel in 2021 has been deviated from by States adopting Ecocide into domestic law, which have instead linked the offence to enumerated offences or international obligations.[154]

Establishing that an accused's conduct caused environmental harm first demands the question of which environmental harm resulted. In the context of pangolins, trafficking presents a relatively straight forward example of anthropocentric harm being caused to individual trafficked animals. Presuming that a seizure is made and it can be determined that a certain number of pangolins were trafficked, and presuming that the responsibility of the accused for that trafficking can be established, the requisite gravity of harm should be satisfied. If the accused is part of a broader network involved in trafficking various species, then they can still be held liable for having caused the harm to the trafficked animals, so long as the requisite mental elements are established, as set out below.

154 *See* Article 94 of the new Belgian Criminal Code—requiring that the Infringement of federal legislation or an international instrument that is binding on the federal authority; Gillett, *supra* note 109; C. Savard, *Belgium Recognises the Crime of Ecocide: A* (*Lukewarm*) *European First* (Oxford Human Rights Hub, Oxford, 2024), available online at https://ohrh.law.ox.ac.uk/belgium-recognises-the-crime-of-ecocide-a-lukewarm-european-first (accessed 2 February 2025). *See also* M. Gillett, 'Ecocide, environmental harm and framework integration at the International Criminal Court', *The International Journal of Human Rights* (2024) 1–37, doi: 10.1080/13642987.2024.2433660.

However, in relation to the risk of extinction, the defence may be able to raise arguments seeking to break the causative chain, such as naturally occurring declines, and the actions of other actors unassociated with the accused, whether private or governmental. While the judges are unlikely to insist that the prosecution demonstrate that the accused's actions alone risked the extinction of the species, they will look for the accused's actions to have at least significantly contributed to that potential outcome if the prosecution has charged it as a form of harm attributable to the accused. For conceptual clarity, it will be important to specify whether solely factual causation is at issue, or whether legal notions such as responsibility are also being assessed, in order to avoid conflating legal and factual assessments. In this respect, the insights set out above from the *KlimaSeniorinnen* case above, both positive and negative, will assist in conducting the analysis.

4.4 *Intention* (*mens rea*)

For any international crime, the requisite intent (known as *mens rea*) must be shown. This usually means that intent and knowledge of the acts and consequences must be established, in accordance with Article 30 of the Rome Statute. Intent can be established in relation to a consequence if that would occur in the ordinary course of events. The only crime in the Rome Statute which mentions environmental harm (Article 8(2)(b)(iv)) requires demonstrating the intentional launch of an attack with knowledge that it would cause the clearly excessive harm to the natural environment.[155] However, that is a war crime which only applies in armed conflict, and so may exclude many cases of animal poaching.

When it comes to intent for environmental harm as a crime, the difficulties in proving this type of offending are compounded. It is not enough to prove the harm, the causation and the attribution as set out above, but it must be shown that the accused at least understood the factual basis of the potential harms they were contributing to and willingly accepted the occurrence of that harm as a natural outcome of their conduct.[156] For the harm to the individual trafficked animals, this knowledge could potentially be inferred based on the accused's role in their trafficking (presuming they were involved in that aspect of the operation). For the knowledge of the harm to the ecosystem produced by removing pangolins, and the threat of potential extinction, this will be harder to establish. The defence will likely argue that the accused's knowledge

155 ICC, *supra* note 76.

156 A. Matwijkiw and B. Matwijkiw, 'Business-as-usual barriers for the crime of ecocide: A multidisciplinary maze', 4 *Journal of International Criminal Law* (2023) e23.

of those harms must be shown if they are to be held against the accused, in accordance with the mental elements of an offence mirroring its physical elements. In rare circumstances, a specific warning may have been issued to a poaching organisation or some kind of written acknowledgement of the risk to the targeted species which can be linked to the accused. However, if that is not the case, the question will arise as to how much an accused needs to know regarding the potential consequences of their actions.

Here, there is considerable guidance by analogy from the jurisprudence of the ICC and other international courts. For example, in relation to crimes against humanity, an essential component is that the accused's acts formed part of an attack on a civilian population. The Courts have held that the accused does not need to know all the aspects of the attack on the civilian population or its impacts, but instead must know the broader occurrence of the circumstances such as the targeting of the civilization population.[157] For animal trafficking, this means that an accused would need not know all the details of the entire operation, but would have to know of the core elements—namely, the movement of endangered animals away from their natural habitat for a profit seeking motive. They would have to understand that their conduct forms part of the wider operation.

Proving this mental element will typically be done by inference based on the accused's role in the operation. Specific evidence may include insider witnesses, business records, and intercepted communications. Physical evidence extracted when trafficked animals are seized may also yield probative evidence such as DNA identification, which can assist to validate the accused's involvement in the criminal offending. Fingerprints of offenders may even be visualized on the pangolin scales themselves.[158] However, combatting cross-jurisdictional pangolin trafficking has encountered significant enforcement challenges, including a lack of resources and equipment able to detect pangolin derivatives, insufficient capacity to identify pangolins and their derivatives on the part of enforcement personnel, and difficulties in establishing precise numbers of trafficked or exploited individuals.[159] Those operational challenges will limit the data available, putting more strain on the courts to resort to legal constructs to compensate for a lack of factual specificity. These challenges will exacerbate the ongoing uncertainty regarding the mens rea for ecocide and

157 ICC: *The Prosecutor v. Bosco Ntaganda*, ICC-01/04-02/06, Trial Chamber VI, Judgment, 8 July 2019, para. 1170.

158 G. Moorat, J. Reed, S. Bleay, M.A. Amaral, B. Chappell, N. Pamment, C. Plowman and P.A. Smith, 'The visualisation of fingermarks on pangolin scales using gelatine lifters', 313 *Forensic Science International* (2020) 110221, doi: 10.1016/j.forsciint.2020.110221.

159 Challender, *supra* note 3.

the uncertainty in turn risks bleeding into factual assessments regarding the legality of acts by perpetrators.

4.5 *Linkage*

A further key aspect typically required to prove culpability for any crime, including crimes against animals, is the linkage between the accused and the perpetrators of crimes on the ground. This differs from causation, as it involves relationships between human beings rather than purely mechanical transactions. International criminal proceedings usually involve high level accused, who are often not directly involved in the hands-on aspects of the offending. Instead, those accused issue orders, directions, and give guidance and support to the physical perpetrators.[160]

However, it is not sufficient to merely demonstrate that the accused is a leader of an offending organisation. For criminal liability to be established, it is necessary that the crimes of the physical perpetrators can be imputed to an accused, or else that an accused otherwise contributes to those crimes. This is typically done through modes of liability. The primary mode involving linkage is co-perpetration, both in its direct and indirect forms. Direct co-perpetration involves a group of accused who each make an 'essential contribution' to the common criminal plan. Because of those contributions, they can each be held responsible for the entirety of the offending as a principal.[161]

Indirect co-perpetration involves attribution of crimes carried out by non-members of the common criminal plan, such as (para)military and police forces, to the members. That attribution can occur when the individual perpetrating non-members are considered fungible and essentially automatically comply with the orders of those who are members of the common plan. Typically, this would see the head of the (para)military and/or police force as members of the common plan, which means that the actions of the police and military can be imputed to them vertically and then, in turn, imputed to the other members of the common plan horizontally.

For the purposes of animal trafficking, the lower-level members of criminal organisations that carry out such conduct on the ground can be potentially equated with police and military forces, subject to careful analysis being conducted regarding their hierarchies and modes of operation. If the physical perpetrators on the ground are shown to be acting at the behest of the leaders

160 ICTY: *The Prosecutor v. Radoslav Brđanin*, Appeals Chamber, Judgement, 3 April 2007, para. 362.

161 ICC: *Prosecutor v. Thomas Lubanga Dyilo*, ICC-01/04–01/06-803, Pre-Trial Chamber, Decision on the Confirmation of Charges, 7 February 2007, para. 326.

of the organisation, and if they are essentially replaceable, then their conduct of the trafficking may be imputed as a form of indirect co-perpetration to all those shown to be in the leadership circle.

For geographically dispersed crimes such as trafficking, involving numerous moving parts, the use of attribution and linkage mechanisms such as these modes of liability will be particularly important. However, even if the crimes cannot be attributed to the leaders per se, they may potentially still be held liable if they aid and abet or otherwise contribute to a common criminal purpose in a substantial or significant way. Here complex organisational analysis of the offending groups will be required. It will also be important to distinguish those who are only involved in lawful shipping and transfer of animals, such as farm animals, from those participating knowingly in the criminal enterprise. Nonetheless, 'agents' who promote the consumption of unlawful pangolin products online can serve as intermediaries in the linkage chain, legally connecting ground-level poachers with high-level business and organisational leaders.

Concerning linkage of perpetrator groups to environmental harms, incorporating scientific assessments into investigations and legal determinations can prove beneficial. In other contexts multidisciplinary and interdisciplinary scientific studies have been able to dispel misconceptions as to the nature and cause of anthropogenic harms to the environment. This cuts in multiple ways; sometimes shown that perceived harm by humans is based on a misunderstanding of ecological and anthropological circumstances. For example, Fairhead and Leach showed that the forest-savanna mosaic in the Kissidougou prefecture in Guinea is not evidence of a 'once great forest that is being degraded by the (mal-)practices of the indigenous inhabitants of aforementioned villages.' They found instead that the landscape was a primarily savanna and that 'villagers promote the development of forest islands more or less deliberately in the course of everyday life, occasionally by planting trees, but more often simply by creating fire and soil conditions that favor forest regeneration in savanna'.[162] The implications for criminal responsibility are stark—perceived misforestation (and potentially underlying acts of ecocide) could potentially be revealed as precisely the opposite. Given the centrality of determining anthropogenic harm in any ecocide proceedings, such scientific assessments present major sources of key information for judicial determinations. The multi-factorial contributors to the decline of pangolins mean it is also important to disaggregate the trafficked species insofar as possible for forensic purposes.

162 J. Fairhead and M. Leach (eds), *Misreading the African landscape: society and ecology in a forest-savanna mosaic* (Cambridge University Press, Cambridge, 1996).

4.6 *Pangolin Species as Victims in ICC Proceedings*

An ancillary issue is whether pangolins which are trafficked or other exploited could qualify as victims before the ICC. Under its present formulation, the ICC definition of victims under Rule 85(a) does not leave room on it face for non-humans.[163] Similarly, animals could also not qualify per se under Rule 85(b) in its present form (though organisations which protect or educate about animals could potentially do so).[164] Whereas the recent OTP draft policy on environmental crimes refers to 'human and non-human' victims of ICC crimes,[165] this wording (though peculiar) may simply refer to natural and legal persons, as provided under Rule 85, particularly given that the OTP could not unilaterally amend the ICC Rules of Procedure and Evidence so as to include animals (such as pangolin species) to directly qualify as victims or may be using the term 'victim' without prejudice to Rule 85.

However, evidence of the victimization of pangolins may still be of relevance to identifying victims' suffering in two respects. First, the suffering of humans as a result of destruction of animals species could be pertinent for determining charges of persecution or other inhumane acts, particularly in cases of special significance of certain species to groups such as indigenous persons. Anthropological studies, along with related disciplines, would be required to explain the nature of the peoples' interconnection with the animal species in question.

Second, the suffering of animals could support arguments in favour of amendment. Any arguments that animals can be victims could be bolstered by ecological studies showing that mammals suffer pain in similar or analogous ways to humans (and thereby personal harm under the ICC test).[166] On these bases, serious thought should be given to amendment to definition of victims to permit it to encompass environmental features if ecocide is adopted as a crime before the ICC.[167] Such an amendment could permit animal species to

163 Gillett, *supra* note 5, pp. 212, 226–227; R. Killean, 'Reparation in the Aftermath of Ecocide', in *Promise Institute Symposium 2023: An International Crime of Ecocide: New Perspectives* (2023), p. 4.

164 *But see* M. Lostal, 'Comment on OTP Environmental Crimes Policy submitted on 16 March 2024 "The Environment and the ICC Legal Framework concerning Victims"' (IUCN, Gland, 2024), available online at https://iucn.org/sites/default/files/2024-04/icc_submission_marina_lostal1.pdf (accessed 2 February 2025), (arguing that Rule 85(b) could be interpreted to include the environment).

165 See OTP draft policy, *supra* note 9, pp. 14, 21, 32 (referring to human and non-human victims).

166 See Lostal *et al.*, *supra* note 17.

167 Gillett, *supra* note 5, p. 228.

qualify as victims before the Court, and potentially benefit from reparations such as remedial measures to protect their ongoing existence.

5 Insights for Disciplinary Integration and Overarching Conclusions

5.1 *Discipline Fusing in the Context of Environmental Harm*

Scientific knowledge is often dispositive for legal proceedings. This is particularly evident in the domain of environmental law, where legal cases often turn on scientific assessments.[168] Correspondingly, studying the use of science in the prosecution and adjudication of environmental crimes yields benefits both at the practical and theoretical levels.[169]

The ecological data regarding the fate of pangolins highlights issues of forensic significance, including the nature of the supply chains, the purpose for which they are trafficked, and the beneficial role of pangolins in their broader ecosystems, as detailed above. These points can provide information to undergird the Court's fact-based assessments. However, there are also gaps in the data, most importantly in relation to overall population numbers. Moreover, ecological conclusions are based on varying methodologies, ranging from specific counts of identified individual pangolins to estimates extrapolated from the weight of seized derivatives or even market demand. Integrating an awareness of these differing sources and methodologies is important for the assessment of evidence and the elements of ecocide in international criminal proceedings, particularly given the open and flexible procedural regime at the ICC which contains few safeguards to protect against misunderstanding evidentiary sources.[170]

The fact-determination process is an oft-overlooked facet of legal reasoning. For many, law is a hermeneutic and textually-bound process, focused on the formulation and interpretation of rules.[171] However, on the dark side of the legal moon lies the constant process of fact-finding and application of established law to the facts, which is in many respects just as critical as the rule-centred facet of legal processing. Ecological science can advance the Court's

168 Thorén *et al.*, *supra* note 122.

169 J. Persson, H. Thorén and L. Olsson, 'The interdisciplinary decision problem: Popperian optimism and Kuhnian pessimism in forestry', 23 *Ecology and Society* (2018) 40, doi: 10.5751/ES-10401-230340.

170 K. MacLean, 'Interactive digital platforms, human rights fact production, and the International Criminal Court', 15 *Journal of Human Rights Practice* (2023) 84–99, doi: 10.1093/jhuman/huac062.

171 G. Samuel, 'Is Legal Reasoning like Medical Reasoning', 35 *Legal Studies* (2015) 323–347, at pp. 324–325.

fact-determination processes in multiple important respects, as detailed above, which will be critical for eventual cases of ecocide. While legal doctrines such as positive obligations on States to mitigate environmental harm can render specific factual assessments unnecessary in some circumstances (as demonstrated by the ECtHR's *KlimaSeniorinnen* case), those legal constructs are not typically applicable to cases of non-State actors and factual determinations will inevitably be required in ecocide and environmental harm criminal cases.

In this light, ecological information can play an important role in informing assessments, such as whether environmental harm is severe, long-term, widespread and sufficiently grave, as well as indicating intention and linkage, as shown above. Yet, each of these terms is non-quantifiable in any pre-fixed discrete sense. For example, widespread does not have a specific numeric minimum area and long-term does not have a specific minimum number of days. These key elements and considerations underlying ecocide all incorporate value-based assessments.[172] Similarly, causation in the legal context incorporates notions of responsibility which exceed those of pure mechanical causes. Accordingly, questions arise as to the extent to which scientific approaches can encroach into traditional legal domains and what impact this can have on law as a distinct discipline.

Regarding the respective roles of scientists and legal actors, traditionally, the labor was understood to be divided between scientific and legal institutions along a sharp line dividing facts from value assessment. Thoren *et al.* observe that 'scientists provide the probabilities—which are taken to be matters of fact—and the decision makers provide the utilities, as these reflect values'.[173] The model held even for experts who, though allowed to give their opinions, must focus these on factual matters rather than normative matters and ultimate value judgments falling for the trial chamber to determine.[174] In the legal context, this division of labour fits into two-step process, with the factual matrix established based on scientific probabilities and the evidentiary record, and then the applicable normative structure superimposed on those facts.

However, factual assertions (or assertions that a hypothesis has a certain probability of being true) often involve value-based assessments.[175] This can be

172 Palarczyk, *supra* note 135, pp. 154–157.

173 Thorén *et al.*, *supra* note 122.

174 *See* ICC, *Prosecutor v. William Samoei Ruto and Joshua Arap Sang*, ICC-01/09-01/11-844, Trial Chamber V(a), 'Decision on Sang Defence Application to exclude Expert Report of Mr Hervé Maupeu', 7 August 2013, para. 23. *See also* M. Gillett and W. Fan, 'Expert Evidence and Digital Open Source Information: Bringing Online Evidence to the Courtroom', 21(4) *Journal of International Criminal Justice* (2023) 661–693.

175 D. Frank, 'Making uncertainties explicit: the Jeffreyan value-free ideal and its limits', in K. Elliot, T. Richards (eds), *Exploring Inductive Risk: Case Studies of Values in Science* (Oxford University Press, Oxford, 2017), pp. 79–124.

seen in forensic techniques such as fingerprinting, which have been based on a requisite number of points of identification, which differs from jurisdiction to jurisdiction. Even DNA matching, which can produce astronomically large probability likelihoods, can still involve value assessments as to which comparative population to utilise and how to calculate likelihood-ratios (as well as reliability assessments regarding chain of custody, contamination, and manipulation of samples and other process errors). Equally, legal assessments incorporate a quasi-factual component of assessing the match between a given situation and past examples. The system of precedent sees normative structures applied to 'like' cases in a similar manner and 'unlike' cases differently. Adjudicative reasoning in this sense is isomorphic, as it involves mapping the core elements of a factual situation against an abstracted set of properties.[176] Given that the facts will have a greater or lesser fit with the paradigmatic case, adjudicators will have to rely on their own probabilistic assessments to conduct the isomorphic comparison, which confounds Thoren *et al.*'s neat division between scientists providing probabilities and decision makers utilities.

When it comes to ecocide against animals, data-based assessments will overlap with value judgments in relation to several 'factual' determinations, such as risk of extinction, time needed for recovery, and relative weight of causative factors (including poaching; anthropogenic and non-anthropogenic habitat loss; climate change). Core elements in the definition of ecocide, such as 'severe', 'widespread', and 'long-term', are legal notions which nonetheless will be heavily dependent on probabilistic factual evidence. Equally, ecologists providing evidence will seek to understand the expected level of certainty in order to calibrate their studies and experiments.

In this light, the paradigm of ecocide highlights that the traditional conception of a sharp fact-value oppositional binary is hard to maintain. That model should yield to a more dialectical conceptualisation, in which the scientific community and legal actors mutually exchange information regarding methodologies, standards, processes and expected levels of certainty. Similar proposals have already been raised in relation to investigating environmental harm, leading to the term eco-forensics emerging.[177]

At the same time, axiomatic legal protections must be maintained as core features of the legal process. An overly deferential attitude towards scientific evidence could lead to the undermining of hard-won principles such as the

176 Samuel, *supra* note 171, pp. 323–324.

177 *See* Ecoforensic factsheet, available online at https://ecoforensic.org/ (accessed 2 February 2025).

presumption of innocence and the burden of proving a case beyond reasonable doubt, particularly if judges simply outsource judicial determinations to scientific actors. Thoren *et al.* refer to the paradigm of 'problem-feeding', whereby problems in one discipline (law in this case) are externalised to another (science).[178] An especially pernicious risk is the temptation to mislabel contentious legally issues as scientific problems and pass them to the scientific community, when in fact the issues are normative in nature.[179] Legal protections such as due process rights have been obtained over centuries but are precarious and remain elusive in many parts of the world. An over-reliance in science risks eroding those protections to the detriment of the right to a fair and public hearing by a competent, independent and impartial tribunal established by law.[180]

Ultimately, data and insights from ecology studies and other scientific disciplines will be essential to effectively prosecute their trafficking. Scientific assessments can assist the determination of the extent of the harm and the causative responsibility of various parties, particularly for environmental crimes, such as ecocide. Moreover, the framework of international environmental law contains established doctrines capable of mediating the relationship of science with the stricture of international criminal law. Specifically, the precautionary principle can be incorporated into the ICC's assessments to justify judicial determinations that a lack of full scientific certainty on an issue such as the exact population numbers of a species is not a basis to obviate responsibility for causing appreciable harm to the species.[181]

More broadly, judges must decide whether the legal elements are fulfilled and should not permit a lack of absolute scientific certainty preclude them from reaching a determination; in other words, they should not predicate their decisions on the availability of fully scientifically certain underlying information. Take the example of the *Finnpulp* case in the civil context,[182] in which Finland's Supreme Administrative Court ruled against the pulp manufacturer Finnpulp on the basis that the best available computerized water quality models did not meet the legal standard of scientific certainty required to demonstrate that there was no risk that the ecological status of lake would deteriorate during the proposed project's timespan. The denial of permits leading to the discontinuance of projects should not be confused

178 Thorén *et al.*, *supra* note 122.
179 R.C. Feldman (ed.), *The Role of Science in Law* (Oxford University Press, Oxford, 2009).
180 *International Covenant on Civil and Political Rights*, Treaty Series 999 (December): 171, Article 14.
181 Gillett, *supra* note 5.
182 Supreme Administrative Court of Finland, KHO:n Finnpulp-päätös (KHO 2019:166).

with inaction; that is rather the application of the precautionary principle to deny the permits. Nonetheless, the *Finnpulp* 'ruling left the scientific modelers deeply confused as to what is expected of them in terms of model certainty, and how they could ever achieve such high standards given environmental complexities and change, and scientific uncertainty'.[183] Consequently, on the legal side, authorities should be clearer and more transparent about the facts and values they are investigating. Meanwhile, scientists should 'should seek to better understand the legal criteria' applicable in legal cases.[184]

For pangolins specifically, the injection of science can assist greater accuracy on the probabilities in order to determine likely factual outcomes. This includes the risk of extinction or endangerment, the likelihood of causation, and similar objective factors. However, the juridification of science must be avoided. Science cannot ultimately determine whether those probabilities amount to 'severe' or 'intentional' conduct but instead should focus on gathering data relevant to harms to the targeted species and any anthropocentric contributions to those harms. Nonetheless, the fact/value binary remain open to, as the preceding analysis has described how scientists incorporate a level of value judgment when determining what they consider an established fact and decision makers have to make epistemic judgements.[185] Similarly, Courts dress up findings in the language of factual objectivity even when they have a normative (or social distribution of responsibilities) facet.[186] Sensibilizing court officials to methodologies in the natural sciences and correspondingly the scientific community in legal standards is particularly important in the environmental crimes realm.[187]

The incorporation of environmental science to international law through ecocide proceedings presents a duality of opportunity. On the positive side, it can provide substantive data points to inform judges' determinations and anchor the parties' evidentiary assessments and submissions. On the negative side, it can both offer an illusory panacea as a means of resolving all factual disputes. The deferral to science can lead to judges outsourcing difficult normative questions and, in case of uncertainty, serve as an excuse for indecision and inaction. The preceding analysis of the crime of ecocide shows that the risk of abdication to science will be acute in the areas where legal standards are highly contested, including in applying the 'severity' criterion, in determining mens rea and on the issue of causation. Scientific studies can help

183 Thorén *et al.*, *supra* note 122.
184 *Ibid*, p. 483.
185 *Ibid*.
186 Ozonoff, *supra* note 137, p. 37–38.
187 Thorén *et al.*, *supra* note 122.

provide a substrate of information on which to assess these factors, but cannot construct the normative parameters of these legal elements themselves.

5.2 *Overarching Conclusions*

Recognizing environmental harm as a serious crime and prosecuting wildlife crimes as acts of ecocide are critical steps in establishing key legal precedents and strengthening global enforcement against environmental destruction. The plight of the pangolin, among the most trafficked mammal globally, exemplifies how the exploitation of such a vital species should be classified as an act of ecocide—a classification that should also be reflected in both national and international legal declarations. The current rates of pangolin trafficking, despite their delicate conservation status and the existence of domestic laws against this, underscore the need for effective criminal sanctions to be applied at the international level. Given that pangolins play an essential role in their ecosystems, the data provides a compelling basis to assess that their anthropogenic extinction (or further endangerment) would constitute a grave form of environmental destruction, which is widespread and long-term, as per the major legal definitions of ecocide. While forensic challenges exist in investigating and prosecuting wildlife crime on an international scale, ecological data and methods can assist to enhance the use of international criminal law to oppose their exploitation.

The interdisciplinary analysis set out herein demonstrates that fusing together ecology and law can generate an enhanced approach to the protection of nature. Scientific assessments can provide the probabilistic guidance and technical specifications that inform the assessment of the severity of harm, and other considerations like causation and linkage, as well as the determination of victim status of humans with special historic or cultural connections with animal species. Specifically, the analysis demonstrates that the severity of wildlife harm can be assessed along three axes: the individual, the species, and the wider ecosystem, all of which rely heavily on ecological science. Causation determinations will also benefit from ecological data, especially as legal constructs such as positive obligations which have been used in the human rights context to overcome limitations in data, cannot be automatically transposed to the realm of individual criminal responsibility. Similarly, linkage and intention can benefit from scientific inputs and the widespread and long-term elements will require an anchoring in quantifiable data, such as soil, air and water sampling along with probabilistic impact charting.

Nonetheless, the delineation between scientists providing probabilities and decision makers utilities, as articulated by Thoren *et al.*, must be qualified by an awareness of the value-judgments and determinations that predicate scientific

research and, on the other hand, the probabilistic component of isomorphic adjudicative reasoning. Cognizance of those overlapping forms of reasoning is fundamental to foster mutual understanding of the methods both on the part of scientists and adjudicators. Through 'intellectual receptivity', to paraphrase Ruiz *et al*., each discipline can enhance its understanding of what is, and what is not, required when contributing to forensic processes, particularly in overlapping areas such as wildlife exploitation. Such inter-disciplinary awareness and transparency can reveal the extent to which legal constructs are utilised to compensate for factual shortcomings in the evidentiary record. The use of legal constructs in this way should be closely scrutinized to avoid improperly outsourcing scientific data gaps for legal solutions, and to limit the risk of diluting normative requirements through incremental adjustments without adhering to proper amendment processes. Equally, excessive juridification could seep into ecological science, diverting it from its focus on discovering and verifying data.

Ultimately, cases of complex multi-variate environmental harm, such as the endangerment of pangolins, will not be resolved through the application of one discipline alone, but instead will require the fusing of relevant domains, including ecology studies and law. Doing so can benefit the accuracy and legitimacy of outcomes, but must be conducted with respect for the axiomatic ontological foundations of each discipline, particularly the judicial obligation to ensure a fair trial and the scientific requirements of rigor, replicability and transparency of methods. The protection of pangolins and other endangered species can be enhanced by an inter-disciplinary dialectic, rather than competition, between ecological science and international law.

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